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EDITORIAL NOTES

B.C.G.A. ACTIVITIES

AFTER the first year of the last war, in 1915, the British Commercial Gas Association held its fourth annual general meeting in London when wartime policy was discussed. On the outbreak of war the policy adopted was to proceed with publicity work in unabated measure; and at the meeting in question this policy was endorsed. We may recall the remarks of the late Sir Francis Goodenough in submitting the annual report. In spite of war conditions, he said, all of them could plainly feel the cumulative effect of four years' steady campaign. The current of public favour was flowing with noticeably increasing force towards the Gas Industry. To withdraw the originating impulse would be the "falsest of false economies. . . . In the Gas Industry they were not working only for to-day or to-morrow. They wanted to buttress and widen the foundations of the Industry for the years to come. . . . to prepare the way for vast expansion in the future." Throughout the war the work went on, and at its termination the B.C.G.A. found itself in a position stronger than in 1914.

The present war has brought about an entirely different set of conditions. We have witnessed the truce between the gas and electricity industries. Activities of the more forceful type were by agreement excluded. But, since the beginning of the war the Association has performed a great deal of useful work. Assistance of an individual nature has been given to undertakings which needed it. Very many helpful publications have been issued. The film library service, after a brief break at the outset, was resumed. Early in the year a "prestige" advertising campaign was launched, and more recently we have had the Association's very active and very successful co-operation in the National Food Campaign. This co-operation has been backed up excellently by gas undertakings throughout the country, and, as we have recorded in the "JOURNAL," never before in the Association's history has there been such a demand from gas undertakings for special literature prepared. Again, there is the link up with the Ministry of Information in the official window display scheme.

The announcement has now been made by the B.C.G.A. that at a recent meeting of the Emergency Executive Committee it was decided that it would not be in the national interest, in present circumstances, to proceed with national advertising in the Press, that no contracts for space will be placed until further notice. It should be emphasized that a similar policy has been adopted by the electricity industry. Perhaps from time to time space will be taken to inform the public of steps of importance which the two industries may take, but it will not be advertising in the sense either of selling or even prestige campaigns.

As readers are aware, the staff of the Association has been considerably depleted by wartime demands, but the work of the Association is by no means temporarily suspended. Advertising is one sphere of activity only. Many other activities have been employed to build up a standard of service to the consumer which should be maintained as far as is at all possible in wartime; and the staff remaining to the Association will deal with requirements of members as they arise, in connexion with films, posters, literature, local advertising, display material, and general information. This service should prove of great use in assisting that showroom activity which, even in these difficult times, can be so beneficial both to the Industry and to the nation. With regard to this activity, the annual report of the Manchester Corporation Gas Department states that immediately on the outbreak of war various services were suspended, but after a period a modified form of hire-purchase for gas appliances was introduced, and cookery demonstrations were resumed. In common with the experience of many other undertakings, these demonstrations have been exceedingly well attended, and special wartime cookery recipes and hints have been the main feature. Again in common with most other undertakings, the Department is working in close collaboration with the local representatives of the Ministry of Food in the National Food Campaign, and their demonstrators meet regularly for the purpose of assisting the Ministry of Food and the public generally in the best interests not only of the Department, but of national requirements. As an aid to these activities, the travelling showroom has been brought into commission. As another example, the City of Salford Gas Department has opened two new showrooms during the past year, as the Committee felt that, in view of the present sales policy of the Gas Industry generally, it was desirable to give the public a better opportunity of inspecting the latest types of appliances, to provide facilities for demonstrations, and to institute a system of regular maintenance. Business from these showrooms is justifying the venture, and plans for further developments in other sections of the area of supply are under consideration. The conditions of the various gas undertakings in different parts of the country since the beginning of the war have become so diversified from the aspect of both the domestic and the industrial load that one cannot lay down hard and fast rules as to what is and what is not desirable for undertakings as a whole. Each undertaking will make its own plan according to its own circumstances, but it can do so in the knowledge that it has the backing of the B.C.G.A. and the valuable facilities of the Association at its disposal.

EXTERIOR LIGHTING

WE have had a good deal to say in these columns since the latter end of 1939 concerning the value of low intensity lighting in our thoroughfares during the hours of blackout. The amenity afforded by the amount of light permissible is out of all proportion to the intensity of the illumination, which is, of course, exceedingly low. We have recorded and commented on the research work undertaken by the Gas Industry and the manufacturers of equipment which culminated in a specification which proved satisfactory to the authorities. We have referred to the co-operative action taken by the manufacturers to supply the equipment on a mass production basis at the lowest possible cost while complying with the stringent regulations enforced, and we have urged local authorities to take steps to install the fittings during the summer months. Early in this year the Minister of Home Security expressed the hope that lighting authorities would arrange for this wartime lighting in the interests of safety, comfort, and a sense of security; and many councils have acted upon this advice, though many, too, have dismissed the matter in all too summary a fashion. The Gas Industry is fully prepared to play its part in the new

safety lighting, and local authorities should avail themselves of its help and co-operation. But we would reiterate that full success will result from this co-operation only if lighting authorities make their requirements known now. Upon this depends the smooth working of a scheme well planned from the outset.

REACTIVE COKE

IN the "JOURNAL" of June 19 we commented on the Institution Communication by Messrs. Thomas and Askey on the production of reactive gas coke by alkali activation. Since then we have published ("JOURNAL" of June 26 and July 10) the written contributions to the discussion on all the June Communications and the Authors' replies. In regard to the Paper in question one of the contributors to the discussion was in critical mood, and expressed the opinion that the method of adding alkali to coal before carbonization is not likely to receive the favourable consideration of gas engineers generally. He went on to remark that the cost of gas production under alkali activated conditions of carbonization, as given in the Paper, cannot be taken as a guide for anything but the experiment at Liverpool, and that from many points of view the activation of coke by alkali after carbonization would be more acceptable to the Gas Industry. In regard to costs, the figures given in the Paper comparing the cost of the gaseous therm from (a) untreated coal, (b) coal with the addition of alkali, and (c) the "Dryco" process were most encouraging. The lowest cost of gas production was obtained under alkali activation conditions—and, as we emphasized previously, the figures given included the necessary adjustments for increased breeze production under activated and "Dryco" conditions, and also the additional costs of cutting and screening which are not incurred in the sale of forked coke. We suppose that the contributor was chiefly concerned about the effect of alkali addition to coal on the life of refractory materials. Examination of the retorts at Liverpool—*i.e.*, superficial examination—has indicated very little difference in condition between retorts used for carbonizing coal with and without alkali; the ultimate expression of opinion rests with the Refractory Materials Joint Committee. And, as the Authors pointed out in their reply, the control of carbonizing conditions is not greater than should normally be exercised to ensure efficient gas making results and proper care of plant. There would seem to be no fundamental reason why gas production costs of the same order as those indicated in the Paper should not be attained by other gas undertakings.

The uppermost thought which we have in mind concerning this work is that a large potential domestic demand does exist for a coke which will burn satisfactorily in the ordinary open firegrate; and we visualize a great expansion of the carbonizing industries after the war. There is another point. The closing of export markets has made the creation of additional demand for coke for domestic purposes of greater importance than ever before. Investigations such as that described by Messrs. Thomas and Askey deserve the fullest encouragement, and it is gratifying to know that the work continues and that their Paper is in the nature of an interim report.

Regulation of Coal and Gas Consumption

The Secretary for Mines announces that he has made an Order under Regulation 55 of the Defence (General) Regulations, 1940, relating to the Control of Coal and Regulation of Consumption of Gas and Electricity. The purpose of the Order is to enable provision to be made for meeting difficult situations that may arise as the war proceeds—*e.g.*, any necessary restriction of the use of coal, gas, and electricity, due to curtailment of supply resulting from enemy action or other causes, or the adaptation of coal distribution arrangements to give the maximum economy in transport and man-power. The expression "coal" includes coke. For the purposes of the Order the quantities of gas and electricity equivalent to 1 ton of coal are 100 therms in the form of gas and 1,400 Board of Trade units in the form of electricity.

Coal By-Products

An article on later pages focusses attention once again on the very great value of the carbonization process and the folly of burning coal in the raw state. The article is reprinted from *Industrial and Engineering Chemistry*, and in it the Authors point out that sulphuric acid refining of crude aromatic light oils, resulting from the carbonization of coal, produces compounds of a complex nature by the coupling of an aromatic with an unsaturated material of the nature of styrene, indene, coumarone, dicyclopentadiene, &c. Isolation of these compounds in commercial purity gives to industry new high-boiling solvents, with a solvent power equivalent to that of benzene, toluene, &c. They are of value in inks, enamels, adhesives, and resin softeners. Catalytic cracking of these oils by distilling in the presence of aluminium chloride produces benzene, toluene, xylene, and higher aromatics.

Coke Marketing

For a long time now a great deal of attention has been paid at Vancouver, B.C., to the efficient marketing of coke. Many references to the efforts put forward have appeared in the "JOURNAL." On a later page the record is brought up to date by an abstract of an instructive article which appeared in the *Canadian Gas Journal*. There is plenty of competition there. Mill wood and sawdust are popular fuels, the automatic coal stoker and oil burning equipment are in the field, and winter weather is mild. But coke has been well sold. The methods adopted and the results achieved are outlined in our abstract.

Industrial Welfare

War inevitably gives an added importance to labour as a factor in production and increases the difficulty of its most effective use. First there is the question of labour supply in each factory, difficult because of the drain to the armed forces, lack of skilled men, and the vast expansion of many factories. Second, there is the question of maintaining the labour supply at the highest level of efficiency, involving problems of training, sickness, accidents, labour turnover, discipline, and relationship. Third, there are the individual problems of the employees, their housing, journey to work, recreation, feeding, personal problems arising out of war conditions and the separation of families. Fourth, there is the tremendous pressure of work on the foremen, departmental and other managers which prevents them from attending effectively to labour questions. These factors make it imperative that all this work should be placed in the hands of a responsible person free from duties directly related to production.

A booklet has been issued by the Industrial Welfare Society, of 14, Hobart Place, S.W.1, entitled "Elements of Industrial Welfare and Personnel Management," for the guidance of those who for the first time are becoming interested in the industrial welfare movement, and it will be sent for 4d. (post free) to any who are in need of up-to-date information on this living subject.

Irish Association

Owing to present difficulties it has been decided to postpone indefinitely the Annual Meeting of the Irish Association of Gas Managers which was to have been held at Dublin on Tuesday, Aug. 13.

Physical Problems in Industry

Help for Professional Men

In order to assist professional men who in the present emergency find themselves presented with technical problems in applied physics of which they do not happen to have had previous first-hand experience, it has been decided to extend the facilities of the Institute of Physics' panel of Consultants. Through this medium enquirers are put into touch with those physicists most likely to be able to offer immediate practical suggestions in any particular case. In the first instance the contact is quite informal; subsequent arrangements are a matter for private agreement between those concerned. The subjects which can be dealt with cover all branches of physics, both pure and applied, including, for example, physical measurements and testing, the design and supply of scientific instruments for special purposes, and the control of processes by physical means.

By acting as a clearing house in this way and supplementing existing official and unofficial organizations, it is hoped to help in the National effort by directing attention to existing solutions of difficulties which, while appearing to be new problems, are often already well-known in other fields.

Enquiries about this scheme should be addressed to the Secretary of the Institute of Physics at The University, Reading, Berks.

Personal

Friends of Mr. Cyril G. Davis will be interested to hear of the recent award of the D.S.O. to his stepson, Major J. R. C. CHRISTOPHER, R.H.A.

* * *

Mr. G. H. ELLIOTT has been appointed by Newton Chambers & Co., Ltd., as the company's representative for the gas industry and general engineering work in Scotland. The appointment of Mr. Elliott follows the retirement of Mr. James Taylor, who has acted for the Ironworks Department of the Company for the past twenty-five years.

* * *

Mr. W. G. PHILLIPS, son of Mr. William Phillips, Engineer and General Manager of Luton Gas Company, has been elected an Associate Member of the Institution of Civil Engineers. His election follows his success in the Institution's examination last April. Educated at Oundle School, Mr. W. G. Phillips entered Queen's College, Cambridge, in 1932, and took his B.A. (Engineering) degree in 1935. The next three years he spent as a pupil with the Croydon Gas Company. In June, 1938, he joined the Woodall-Duckham Company. Since September last year he has been with the Luton Gas Company as personal assistant to the Engineer and General Manager. He is the fourth generation of the Phillips family to be associated with the managerial side of the Company.

Obituary

Samuel Milne

Mr. Samuel Milne, who retired in April of last year from the position of Engineer and Manager of the Aberdeen Gas Department after 48 years' service with the Corporation, died on July 13, after a short illness, at the age of 68.

Mr. Milne entered the Department as a draughtsman and was acting Gas Engineer before he succeeded the late Mr. A. Smith as Engineer and Manager in 1903. Some idea of the development which has taken place at Aberdeen since he joined the Undertaking may be gained from the fact that when he entered the service in 1891 the amount of gas sent out was 367 million cu.ft. per annum. In 1938 the amount was 1,880 millions. A little known piece of work undertaken by Mr. Milne during his early days at Aberdeen was the designing of the original electricity works and, later, the first of the Millburn Street buildings for the Electricity Department. At a time when the use of gas was increasing rapidly the services of Mr. Milne were sought by many towns in the North to design and supervise the installation and development of gas plants.

President of the North British Association of Gas Managers in 1912, Mr. Milne also served on Committees of the National Gas Council, the Federation of Gas Employers, The Institution of Gas Engineers, and the B.C.G.A. Locally his qualifications as an Engineer were recognized by his appointment for a term as President of the Aberdeen Mechanical Society and Aberdeen Association of Civil Engineers. For many years he was a member of the local Rotary Club and one of the founders of the Business and Professional Club, of which he was a former President.

Among those present at the funeral were Mr. W. Drummond (Secretary of the National Bodies in Scotland), Mr. John Scobie (Engineer and Manager of the Stonehaven Gas Company), and Mr. J. Dickson (Assistant Gas Engineer at Dundee). Mr. Milne is survived by his wife and son, Mr. Harold S. Milne, the present Engineer and Manager of the Aberdeen Gas Department.

An Appreciation

Some men achieve greatness in their particular business sphere because of successful practical effort. Others because of the genius and fellowship of good character. It can be said of Samuel Milne with a surety and unanimity that his life throughout possessed both of the characteristics. Born in Aberdeen, his career in youth and manhood was spent in the Granite City by the Northern Sea. He entered the employ of the Aberdeen Gas Undertaking at the buoyant age of 20. Trained under Alex. Smith, his predecessor, whose practical good management and severe Scottish character are still remembered, Mr. Milne some 38 years ago succeeded to the chief position. His success as Engineer and Manager of an important commercial undertaking has been of a high standard throughout. His engineering ability is displayed in the structural works plant and its layout, as seen in the Aberdeen works of to-day. As regards the commercial working of the business his native instinct, and his power of analysis of money value, in sowing and reaping, ensured a result of high economic worth. Two evidences only need reference. At the end of his long period of office, and with a progressive sale of gas, the burden of capital debt per million cu.ft. was the strikingly low figure of £73, with gas rates of 2s. 3d. to 1s. 4d. per 1,000 cu.ft., equal to 5.4d. to 3.2d. per therm.

But the chief merit of Mr. Milne's life service was his strength and uprightness of character. To this we pay reverence and homage. Not to all of us is given the power to command the same altitude of respect and admiration of character. There existed a purity and unselfishness in his career, and this in business, as in his domestic life, and noticeably in the sphere of his close attachment to the Church of Scotland as a member and office bearer. Mr. Milne was all in all the perfect gentleman, and throughout the whole of the Gas Industry there remains as one award to his memory the gladness of his friendship and his support of all that was worthy.

J. W. N.

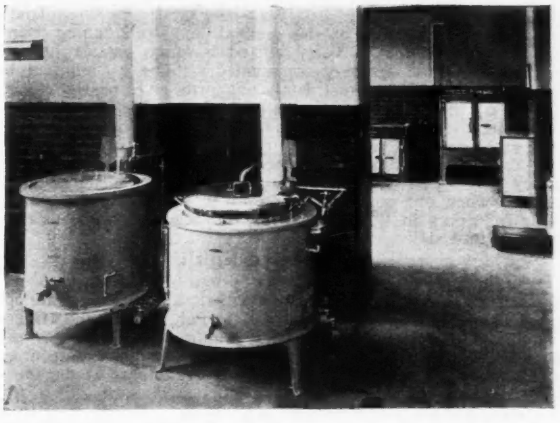
Directory of British Fine Chemicals

New Edition

The Association of British Chemical Manufacturers have published a new Edition of their Directory of Fine Chemicals manufactured in Great Britain, superseding the Edition published in 1935. All chemicals listed in the 79 pages of this comprehensive directory are actually manufactured in this country, and are generally obtainable at short notice from one or other of the 61 firms whose names are set out in the list.

The introduction observes that the support given by British research chemists and by all users of fine chemicals has grown with the years since the publication of earlier editions of this list. There is, on the other hand, room for further development of the practice of demanding British fine chemicals, and the past progress of the industry is ample justification for the claim that the British manufacturers can satisfy the demand for fine chemicals of the highest quality. The co-operation of all users of fine chemicals is therefore requested in continued and undivided support of the industry. Questions of difficulty and enquiries for chemicals not listed in the Directory should be referred to the Association of British Chemical Manufacturers, 166, Piccadilly, W.1—from whom all *bona fide* users of fine chemicals can obtain a copy of the new Directory free of charge upon application.

Feeding of London Children



Communal catering for school children is now a proved success, not only in permanent schools, but in the reception areas, where alternative methods of feeding have proved too expensive and troublesome. The Radiation gas cooking equipment shown here cooks for London school children and is particularly suitable for this type of catering, for in an emergency it can quickly be transported elsewhere and immediately set to work wherever there is a gas supply. No flues are necessary, while the "Regulo" controls enable unskilled helpers to turn out, day after day, meals worthy of a first-class cook

A Ministry of Food demonstration of gas cookery in wartime and economical hints for the housewife was brought to the notice of the inhabitants of Stamford by the Stamford and St. Martins Gas Light and Coke Company by the distribution of neat little circulars, each in an unsealed and unaddressed envelope.

After the Consideration at the meeting of Hinckley Urban Council on July 10 of the Gas Engineer's report stating that wage increases in the future would cost the gas undertaking some £650 to £700 a year, the Chairman of the Gas Committee said that an increase in the price of gas in the not far distant future was likely, although so far the Undertaking had managed to keep going without the necessity of an increase.

By 18 Votes to 3, the Gainsborough Urban Council at their July meeting decided upon a modified form of street lighting for next winter. The cost of converting 30 lamps is put at £67 10s., with £109 10s. for maintenance.

In Pursuance of the Llanfairfechan Gas Order, 1940, dated July 5, 1940, made by the Board of Trade under Regulation 56 of the Defence (General) Regulation, 1939, the Holyhead & North Wales Gas and Water Corporation, Ltd., give notice that as from Aug. 1, 1940, the Company will supply gas of a calorific value of 450 B.Th.U. per cu.ft.

A Century-and-a-Quarter of Gas at Liverpool

NEXT month will mark the one-hundred-and-twenty-fifth Anniversary of the founding of the Liverpool Gas Company, and the current number of the undertaking's *Co-Partnership Magazine* gives some interesting sidelights on the early days of gas in Liverpool, whose consumers now exceed 240,000.

Precise details of the actual foundations of the Company are lacking, and a certain amount of obscurity prevails; but the approximate date is placed beyond doubt by a news items in the *Liverpool Mercury* of Aug. 18, 1815. On that date the *Mercury* announced that "there is at length a prospect of the speedy introduction of the gas lights into this town. We have before us a prospectus, now issuing by Mr. J. Hargreaves, a gentleman who has had long experience in the management and extensive erection of all the requisite apparatus. We sincerely wish him that success, which it would be almost an insult to this public-spirited town to entertain the slightest doubt of."

The first Liverpool man to realize the potentialities of gas was Jonathan Varty, a coach builder, whose premises in Dale Street occupied the site of the present District Bank at the corner of Batchelor Street. Unfortunately, Varty's early enthusiasm was not shared to any great extent by his fellow townsmen, and the necessary capital for the project was not forthcoming. Hargreaves and Varty, however, were convinced that if a practical demonstration of the superiority of gas lighting over other methods were made, it would unloosen the local purse-strings. With the limited resources at their disposal, therefore, they erected a small gas-making apparatus at Varty's Dale Street premises, and on a dark January night in 1816 their labours reached fruition—"the gas lights" were introduced into Liverpool. On Jan. 16 of that year a writer in the *Mercury* thus described the occasion:

"Liverpool Gas-lights:—Two large gas lamps, with three burners in each, have been lighted with gas and exhibited for the last few nights at the front of the Town Hall. The light is so brilliant that a person may with ease discover the hour by his watch at a distance of 20 or 30 yards. We understand that it is intended to light the dock lamps by this method, and we trust that it soon will become general." Varty affixed a lamp outside his own premises, and the *Mercury* commented: "The gas-lamp at the coachmaker's in Dale Street, lately put forth, gives nearly as much light as all the other lamps in the street."

Despite the venture's "good press," however, many townsfolk were still apprehensive of the dangers of the new form of lighting. Varty's insurance company, indeed, threatened to vitiate his fire policy if he persisted in his experiments; a not unreasonable attitude when one considers that even in these days the erection of a gas-works in the cellar would be regarded with disfavour by one's insurers!

Progressive Spirit

Some people displayed a more progressive spirit, and it is appropriate that the names of the Company's first two private consumers should be placed on record. On Feb. 2, 1816, the *Mercury* announced that in addition to "the two very handsome lamps" outside the Town Hall, "the shop of Mr. Phelps, Confectioner, in Castle Street, and Mr. Well's Carpet Warehouse at the top of Dale Street" had installed gas lights and were "brilliantly illuminated in the manner of the Metropolis." It will be observed that Mr. Phelps, of Castle Street, the earliest-mentioned private consumer of gas in Liverpool, was a confectioner. As an example of consistency it is, perhaps, worthy of mention that after a century-and-a-quarter, gas is still the fuel most favoured by local confectioners.

About this time a public company was formed which had its first general meeting at the Crown Hotel, Redcross Street, on March 1, 1816. A contemporary account of the proceedings is still in the Company's archives.

Hargreaves, having successfully launched his Liverpool project, now disappears from the scene. It is probable that he afterwards promoted gas undertakings in other cities and towns. Varty continued his active association with the Company, which, in 1818, obtained a Charter of Incorporation by Act of Parliament. Under the terms of this Act the Company obtained permission to raise £50,000 in 500 shares of £100 each.

The identity of "Mr. J. Hargreaves," the actual founder of the Company, was not known until recently, when the pursuit of two clues resulted in the discovery of a few facts concerning him. The first of these clues was a letter in the *Liverpool Mercury* of Oct. 27, 1815, signed "James Hargreaves." Writing in the third person, Hargreaves, who was evidently replying to some local criticisms of his appointment as engineer in charge of the new undertaking, stated that the reason for his having been given "the direction of completing the apparatus and machinery" was because "the plan being all his own, he considered himself the most proper person to superintend and direct its execution."

The second clue appears in Sir James Picton's "Memorials of Liverpool" where it is stated that gas was introduced into Liverpool by "Mr. J. Hargreaves, the engineer of a chartered London company." It is evident from Hargreaves' letter to the *Mercury* that he was experienced in gas making and distribution. Even if the evidence of his own pen were suspect, it is inconceivable that Varty and his friends should join in his project without first verifying his credentials. In 1815 the only place where such experience could have been gained was London, where a gas company had been operating since 1812. In view of the passage from Picton, quoted above, it was surely more than a coincidence that the name of the London undertaking should be "The Chartered Gas Light and Coke Company."

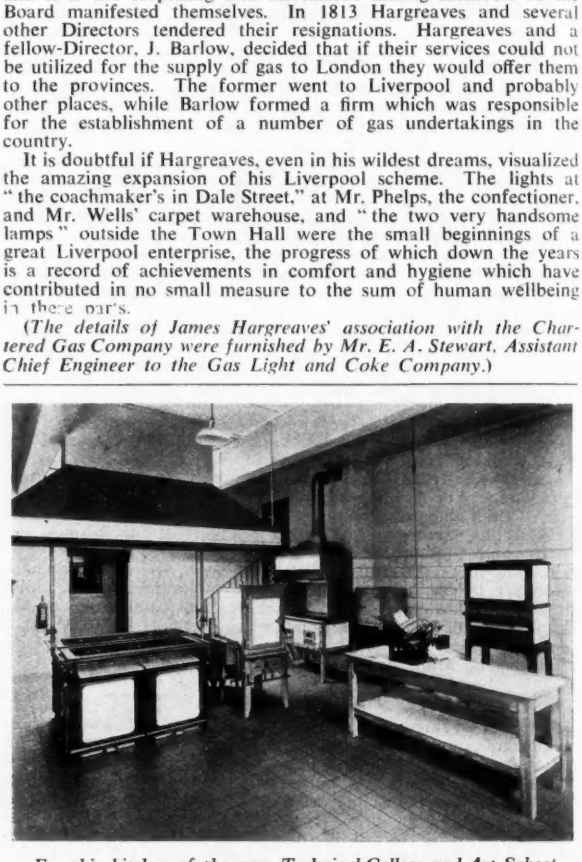
Link with London

A request for information concerning Hargreaves was therefore directed to the present Gas Light and Coke Company, of London, which very kindly instituted an enquiry into its early history, the outcome of which establishes beyond doubt the identity of Hargreaves and also reveals the interesting fact that before coming to Liverpool he had played a leading part in the formation of the Chartered Gas Light and Coke Company. Hargreaves, therefore, provides a link between the Liverpool Company and the Gas Light and Coke Company.

James Hargreaves was one of the original sponsors of the Chartered Gas Light and Coke Company and references to him occur in publications dating from 1809. When the London Company was formed in June, 1812, he became Deputy Governor and was responsible, with two other engineers (Winsor and Accum), for all that pertained to the technical incidence of output and distribution. In Clegg's *Practical Treatise on the Manufacture and Distribution of Coal-Gas* (1866) it is stated that "from the formation of the Company to 1813 . . . . the erection and management of the Works had been entrusted to Messrs. Winsor, Accum, and Hargreaves." Clegg describes the enormous difficulties under which these early engineers worked. Numerous experiments, at the expense of a large portion of the capital, had to be made, and it is not surprising that dissensions among members of the Board manifested themselves. In 1813 Hargreaves and several other Directors tendered their resignations. Hargreaves and a fellow-Director, J. Barlow, decided that if their services could not be utilized for the supply of gas to London they would offer them to the provinces. The former went to Liverpool and probably other places, while Barlow formed a firm which was responsible for the establishment of a number of gas undertakings in the country.

It is doubtful if Hargreaves, even in his wildest dreams, visualized the amazing expansion of his Liverpool scheme. The lights at "the coachmaker's in Dale Street," at Mr. Phelps, the confectioner, and Mr. Wells' carpet warehouse, and "the two very handsome lamps" outside the Town Hall were the small beginnings of a great Liverpool enterprise, the progress of which down the years is a record of achievements in comfort and hygiene which have contributed in no small measure to the sum of human wellbeing in these parts.

(The details of James Hargreaves' association with the Chartered Gas Company were furnished by Mr. E. A. Stewart, Assistant Chief Engineer to the Gas Light and Coke Company.)



For this kitchen of the new Technical College and Art School at Guildford, built for the Surrey County Council, Radiation, Ltd., have supplied cooking apparatus and other equipment to cater for 300 meals. This comprises two double-oven ranges, steamer, fish-fryer, griller with hot closet superimposed, vegetable boiler, and tea boiler, while among the labour-saving devices they also supplied a potato peeler and chip machine. The Architects responsible for the planning of the kitchen were Messrs. Jarvis and Richards

Supplement to BS/ARP 33

A new supplement gives a complete set of drawings of a typical stirrup pump, which if correctly made of suitable materials, should comply with the requirements of BS/ARP 33. All essential dimensions are given and special attention has been paid to particular points where failure occurred in earlier models.

Copies of this BS/ARP No. 33 may be had from the British Standards Institution, 28, Victoria Street, S.W.1; price 8d. (post free).

Closing of Adderley Street Works

THE current issue of the Birmingham Gas Department's Magazine refers to the closing of the Adderley Street Works as a manufacturing station after a useful life of nearly a hundred years. The Works were constructed by the Birmingham and Staffordshire Gas Light Company about the year 1844.

It would have been extremely interesting if it had been possible to give a short history of the Works and recount the changes that have taken place. This does not appear to be possible, particularly as the change of ownership in 1875, when the Corporation acquired the undertaking, severed all links with the earlier history.

The present site was the original one and occupies an area of about 5½ acres bounded by Adderley Street and New Bond Street, and is situated on the banks of the Birmingham and Warwick Canal. There is no railway accommodation on the Works. The coal was originally conveyed by horses and carts and latterly by Fordson tractors and trailers from the railway depot at Landor Street.

Productive capacity varied between two and three millions per day according to the season. No extensive reconstruction of the carbonizing plant has been carried out since 1909. For many years after that date the plant was among the most efficient in the Department. Some of the plant had been in commission for extraordinarily long periods. The holders, purifiers, and meters were installed before the Corporation acquired the Works in 1875, and a tar and liquor pump had been in constant use for at least 70 years. The practice at Adderley Street of carbonizing in horizontal retorts was never changed, and the requisite quality of gas was produced by admixture with water gas produced by external Humphreys & Glasgow machines.

It is common knowledge that, by design, the plant was to have finished its useful life by the spring of 1941. Certain technical considerations introduced by oil washing for benzole, together with other special considerations, made it possible to apply the closure a little earlier than was expected. When it has been necessary to replace certain plant, it has always been so arranged that the new units chosen would be suitable for service elsewhere. Since the shut-down, therefore, valuable transfers of plant to the other Works have already taken place, and the scrap material is a useful contribution to the war effort. The structural steelwork has been retained to constitute a reserve for the Department.

Although this station was by far the smallest in the Department, the personnel has always held its own with a sturdy independence. They participated successfully in every activity and this year the Ambulance Team won the Dr. Savage Shield. Out of a total complement of about 120 men, 13 have joined the Forces since last August, and four gave their lives during the last war.

Most of the men now transferred had served at Adderley Street only, and it has been surprising how quickly they have adapted themselves to a completely new life elsewhere. The Management have endeavoured to assess each man's capacity for a new job and in certain cases have been able to offer alternate choice of employment. The fact that this mass transfer of labour and staff has been arranged without any real trouble is a great tribute to the corporate spirit of the Department.

The Gas-Works of the Tow Law (Co. Durham) Urban District Council are to be closed down on Sept. 30 next, depriving over 400 consumers of their gas supply. The output of the works has been in the region of 5 million cu.ft. per annum.

Campaign for Collection of Old Linen Drawings

Here is a chance for architects, engineers, builders and others with drawing offices to make a novel but valuable contribution to war-time economy and at no cost to themselves.

The Women's Volunteer Service Headquarters (Thrift Section), under the direction of Lady Gower, has discovered that old linen drawings and tracings can be easily treated, and utilized for the making of all kinds of articles where the use of fine linen is required—surgeons' caps, masks, pillow cases, aprons, and even children's frocks and underwear.

The Building Centre has undertaken to organize a campaign to supply the W.V.S. with material sufficient to keep busy their hundreds of members all over the country who are anxious to help in this great scheme of making things out of material which may otherwise be wasted. There must be thousands of reams of old linen drawings in all those places where it is a habit to store drawings when a job is finished in the very uncertain hope that there may at some time or other in the future be a need to refer to them in connexion with extensions or other jobs. It is for all these old drawings in linen, *not* paper, which this appeal is now being made.

Bundles should be addressed to The Building Centre, 158, New Bond Street, W.1 (marked "Old Linen" with name of sender) where a clearing depot has been arranged for the whole country.

Gas Meter Testing at Nottingham

In his report on the work of his Department for the year ended March 31 last, the Statutory Inspector of Gas Meters to the City of Nottingham (Mr. C. P. Tatham) observes that the number of meters tested during the year was 30,797, this being a decrease of 2,412 on the previous year. Of these, 18,256 were new meters and 12,541 were old meters, while 23,769 were of the prepayment type and 7,028 were of the ordinary type.

A number of meters, the accuracy of which was in dispute between a buyer and a seller of gas, were submitted by various gas undertakings and local authorities for official certification. The number of meters so dealt with was 186, of which 157, or 84.4%, were rejected and certified incorrect, their seals being officially defaced. The remaining 29 meters were approved, certified correct, and restamped.

The following table gives the results of the tests :

4,805 meters registered Fast, not exceeding 2%
23,059 " " Slow, " 3%
1,873 " " Net "

29,737 Total meters stamped correct.
1,060 Meters were rejected incorrect.

30,797 Total meters tested.

SUMMARY.

Stamped	Rejected	Total Tested	Percentage Rejected
29,737	1,060	30,797	3.44%

The testing fees for the year amounted to £2,219, which represents a decrease of £174 on last year's figures. Expenditure during the period amounted to £1,652, leaving a surplus of £566, which has been transferred to the General Rate Fund.

□

H.R.H. the Duchess of Kent visited the A.R.P. Exhibition at the Housing Centre, 13, Suffolk Street, S.W.1, on July 10. The Exhibition was referred to in the "JOURNAL" for June 26. Our photograph shows Dr. Bernard Friedman, Managing Director of Ascot Gas Water Heaters, Ltd., who stood guarantor for the cost of the Exhibition, being presented to H.R.H. in front of the B.G.F. display. Mrs. Madge Waller, Hon. Director of Publicity at the Housing Centre and organizer of the Exhibition, is seen in the background

□

COAL BY-PRODUCTS

From the July issue of
Industrial and Engineering Chemistry

By WILLIAM H. CARMODY
and
HAROLD E. KELLY,
Carmody Research Laboratories, Inc.,
Springfield, Ohio

POLYMERIZATION and many other reactions of unsaturated coal-derived compounds have been extensively described in the literature, and their common reactions are well understood. When such reactions are clean-cut and the yield of products is at a high figure, much attention is centred on them. However, when the reactions are considerably obscured and complicated by the concurrence of a number of reactions, with yields near the vanishing point for any single product, we have all the requirements of a neglected opportunity.

Such a picture takes on new aspects when the materials become available to the extent of millions of gallons per year. Their isolation as a by-product gives them the aspect of new and definite raw materials on a gallonage basis alone. Such a picture as is here presented has given rise to new industrial products and has consumed materials of previously low value. Rapid progress has taken place within the last several years and has resulted from concerted effort to understand the reactions, and from a theoretical study of these complex materials.

In the high-temperature carbonization of coal, common practice is to scrub out the light oils with a high-boiling petroleum wash oil. They are then distilled to give benzene, toluene, xylene, and higher aromatics.

The crude fractions are acid-washed with a small amount of concentrated sulphuric acid which polymerizes the unsaturated constituents and produces a mixture of high-boiling oils and resinous polymers. The temperature is not controlled in this step, and any rise causes other reactions to take place with the formation of other kinds of resins and oils, which are not simple polymerization products. After separation of acid, the oil is washed; then it is distilled to produce commercially pure aromatic solvents. The residue remaining in the still is a mixture of the polymers and high-boiling oils.

These residues are then combined and subjected to a final distillation to strip out all the content of low aromatics. The residue from this operation forms what is known in the trade as pure still residue. It comprises polymers of unsaturated compounds and other reacted bodies of non-polymer structure. Resolution of this mixture into its individual components has not been possible heretofore, at least by ordinary or commercial means, and no market has existed for such residues in their natural state. Disposal has conveniently been carried out by adding the mixture to some types of tar, or it is burned as fuel owing to lack of more profitable disposal.

General Characteristics of Residues

Careful attention has been directed toward such residues, since they are one of the end products of every coke plant, and there appears to be little or no chance of avoiding their formation. The simplest procedure is to subject them to combined steam and vacuum distillation to remove the oil-like materials from the more complex and non-volatile portion. This is now carried out commercially by heating to 200-275° C. and blowing with live steam (2).

Such a treatment will produce approximately 50% of the original charge as a wet steam distillate. Settling or chemical drying places the material in a condition to be used in any subsequent operation.

The dry steam-distilled oil is reddish in colour and has a specific gravity falling within the range of 0.97-1.01 at 20° C. It is characterized by a strong odour of aldehydes and sulphurous compounds, and may be phenolic owing to decomposition of unknown materials. Careful fractionation resolves the oil into the following cuts:

Cut No.	Temp., °C.	% Based on Dry Oil.	Cut No.	Temp., °C.	% Based on Dry Oil.
1	To 200	2.05	5	305–310	14.1
2	200–250	4.31	6	310–320	14.1
3	250–287	22.2	7	320–325	11.6
4	287–305	23.1	8	325 up	7.3

The greater proportion of the oil has a distillation range considerably below the boiling points of pure di-indine and di-coumarone, and obviously can be neither (1). The oil definitely originated from the unsaturated compounds originally present, and must have at least one molecule of unsaturate combined in some new and unknown manner.

Combination of the main cuts and careful fractionation over sodium hydroxide were made. The resulting materials were sufficiently pure to be identified and to permit the main characteristics to be determined. This early exploratory work brought to light the fact that the main bulk of the oil represented a mixture of a number of members of a new family of aromatic derivatives, in which the aromatic nucleus had one of its hydrogen atoms substituted by a molecule of the initially present unsaturated compounds, in such a manner that any unsaturation had been eliminated because of hydrogen migration.

The purified oils were non-reactive with aluminium chloride, and coloured upon treatment with sulphuric acid but evolved no heat. Many of the individual cuts were identified, and their structural composition was recognized. This family of pseudopolymers gave evidence of being constructed generally of one molecule of ordinary aromatic combined with one molecule of unsaturated aromatic of the type indene, &c. A sufficient number of materials were studied to suggest that these oils may be composed of either cyclopentadiene, styrene, coumarone, indene, and di-cyclopentadiene, in firm chemical combination through primary valencies with one molecule of either benzene, toluene, xylenes, or higher alkyl aromatics. The nature of the reaction involved in their formation permits the theoretical formation of each of the above twenty or more possible combinations. In actual practice not all of these combinations have equal possibility of occurring because of the boiling ranges of the components involved. For example, it is to be expected that styrene (boiling at 142° C.) and the xylenes (boiling at 136-142° C.) might react since both are present in the crude cuts, and that styrene and benzene (boiling at 80° C.) would not ordinarily be found in the same crude cuts because of the wide difference in boiling points.

Kraemer and Spilker (3) recognized and described the reaction product formed from styrene and xylene, and stated that styrene reacted in a similar manner with the alkyl-benzenes. The reaction has been found more generally applicable than was suspected from their early work.

Owing to their peculiar mode of formation and to the fact that approximately 50% of the molecular structure is due to the original polymerizables, these new solvent oils have been termed "pseudopolymers." In addition, their boiling points are considerably above that of the cuts in which they originated and, if not given careful identification tests, might erroneously be classed as polymer oils.

Laboratory work over a period of several years and in progress at present has been carried out with the main object of preparing, on a small scale, each of the members of this newly discovered family of aromatics and of examining their properties.

Properties and Uses of Oils

With the available solvents of coal origin, it is possible to cover the range from benzene to refined high-flash solvent naphtha (approximately 80° to 195° C.). From this point there is a gap in the choice of simple and refined solvents, until the range above 300° C. is reached, where the simple dimer oils of indene and coumarone occur. In this 100° interval it has been common practice to use crude shinglestain oils, heavy naphthas, or blends of them. Until recently no single aromatic solvent of simple composition was available. The range 150-200° C. is now covered by an additional solvent having the sharp odour of benzene and cyclopentadiene. In certain respects it resembles crude solvent naphtha, since it is initially pale amber in colour and darkens upon standing. It has no inclination to polymerize and is not a polycyclopentadiene. It is present only in small amount; its composition is unknown, but it may be the first member of the series and be constructed from cyclopentadiene and benzene. It has high solvent power for resins, drying oils, &c.

The material in the range 200-250° C. differs from the above mainly in odour. It has a sour or musty odour and a relatively low specific gravity for an aromatic product, and is of minor importance owing to small volume.

The cuts extending from 250° to 320° C. are extremely important since the bulk of the oil (about 75%) falls within these limits. The oils are so accumulated in this range that it seems proper to call this cut the residue proper. The oil is amber in colour and has a specific gravity averaging close to 0.98 at 20° C. The aniline point is 26° C., which is in close agreement with the aniline point of commercial refined naphtha and related aromatic solvents usually encountered in the lower boiling ranges. For comparison it may be stated that the corresponding petroleum solvent of similar boiling range has an aniline point close to 60° C.

This elevation of boiling point and retention of the solvent characteristics of the lower members of the aromatic solvent series is attributed to the fact that the elevation of boiling point is brought about, not by attaching alkyl groups to a central nucleus, but by attaching an aromatic-derived material to the central aromatic nucleus. This "weighting" of the aromatic molecules is caused by the reactions occurring during the acid-washing step very early in the recovery. More often, where two aromatic rings are in close proximity in the same structure, the resulting compound is a solid, unless hydrogenation or alkyl substitution has taken place. Naphthalene, diphenyl, phenanthrene, &c., may be cited as examples, though the analogy is not perfect.

The dimers of indene and coumarone are found in surprisingly small amounts. This apparent absence of polymerization of the unsaturates in the lower stages in appreciable extent is believed due to the extreme dilution in which they occur in the original crude light oils and to the preponderance of aromatic solvents with them. Treatment with the wash acid activates the unsaturated monomers

but because of the extreme distance between centres of activation and polymerization, they do not have opportunity to collide with one another, but react with aromatic molecules in their immediate vicinity and become inert bodies. This type of "unsaturate-aromatic" combination is not generally recognized or known.

These oils in refined condition are extremely useful in the field of inks, enamels, dye solvents, adhesives, gasholder seals, resin softeners, insecticide bases, and weed killers.

Catalytic Splitting of Oils

In the refining of solvents, sulphuric acid is the common reagent for removal of unsaturates. These materials and the aromatics which accompany them have the same magnitude of molecular weight. Combination of unsaturate and aromatic in this new type reaction robs the batch being treated of an amount of benzene, toluene, or xylene in amounts about equal to that of the unsaturate present. Based on the relative amounts of genuine polymers and pseudopolymer oils in the resulting residues, it is rare that such reaction is favoured exclusively.

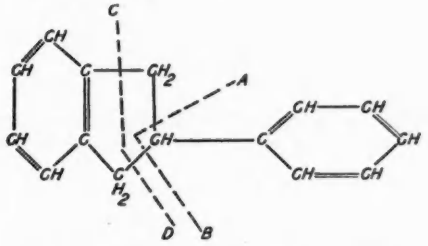


FIGURE 1. SCISSION LINES LEADING TO THE FORMATION OF AROMATICS OF LOWER BOILING POINT THAN THE ORIGINAL COMPLEX

Attention was drawn to this field, and it was a natural development to try to recover all or part of the aromatic content by some form of cracking or regeneration. This has been successfully accomplished but in a manner not originally anticipated. The unsaturate originally present has also been converted to an aromatic and appears in a form differing from that initially present.

The following generalized scheme indicates how such a conversion is carried out. The compound shown in Fig. 1 is that formed from indene and benzene, for illustration. The exact point of attachment is unknown, but the radical might be attached to the indene either at the 2 or 3 position. The two aromatic rings are not directly attached to each other but are joined through the intermediate cyclopentadiene ring system. Isomers other than that depicted may exist, but the actual end products obtained indicated the illustrated structure to be a certainty.

By the addition of anhydrous aluminium chloride to such a dry oil, followed by slow heating, a temperature is reached at which distillation begins, and the greater proportion of the original high-boiling oil is converted to an oil of lower boiling range and of relatively simple composition. From such cracked distillate there can be obtained representatives of all the simple aromatics, with no cyclic side-chain attachment. This treatment does not liberate the original constituents by severing the bond joining the two unit molecules but, by a deep seated scission of other bonds and through hydrogen migration, produces the saturated aromatics.

For example, if scission is made to take place along the line *A-B* (Fig. 1), which in effect removes one carbon atom from the indene structure, *o*-xylene is produced from the fragment by hydrogen migration from the cracked residues. The original aromatic molecule acquires one additional carbon atom, and in the case cited toluene is formed. In this case two separate and distinct aromatics are formed. If scission of the bonds occurs along the line *C-D*, the indene structure gives rise to toluene, while the original aromatic structure gives rise to ethylbenzene. Such a postulated mechanism must also account for the partial hydrogenation of the fragments to consume the free radicals and deliver the stable aromatic compounds out of the reaction mixture.

Simultaneously with the above aromatic formation there is formed a high-melting residue deficient in hydrogen, rich in carbon, and very little soluble in the usual hydrocarbon solvents. It is widely known that aluminium chloride as a reagent causes the simultaneous splitting-hydrogenation-dehydrogenation reactions to occur, with the transfer of hydrogen from one position to another. This is the reason why aromatics are formed at the expense of other fragments which remain unsaturated and appear as polymerized resinous masses.

In carrying out such semi-synthetic production of aromatics, it is sufficient to add aluminium chloride to the dry oil and progressively raise the temperature to a maximum of 250-260° C., where the greater bulk of the reaction is completed. If reaction is carried beyond this temperature, partly saturated aromatics are obtained which are of lesser value. The distillate is collected, sulphur and acid are removed by washing, and the distillate is then carefully fractionated. The aromatics recovered are found to pass all commercial specifications.

Table I illustrates the results of a number of tests employing the entire composite dried steam distillate obtained from residues. In each case 500 c.c. of oil were cracked, and the distillate was recovered and separated into rough cuts containing mainly benzene, toluene, and xylene. The relation of amount of catalyst used to total final product is well brought out. The ratio of synthetic aromatics to one another is of interest.

TABLE I.

RESULTS OF TESTS ON THE COMPOSITE DRIED STEAM DISTILLATE FROM RESIDUES.

	% $AlCl_3$ Used[a]							
	2	3	4	5	6	7	8	9
Total vol. found by heating to 250–260° C., Cc.	70	100	150	155	195	238	238	240
Distn. of synthetic aromatic mixt.								
First drop, ° C.	92	90	88	81	81	76	76	73
Cc. to 105° C.	1	2	2	2	2	11	9	14
to 120	3	3	5	12	17	43	43	42
to 130	7	17	28	32	48	58	65	67
to 150	34	68	108	125	152	184	188	188
to 160	38	73	117	129	162	188	192	195
to 170	41	76	121	134	168	197	200	200

[a] 500 cc. of oil were heated with the indicated percentage of aluminium chloride.

An amount of catalyst in excess of about 7% does not materially increase the yield; the use of excess catalyst does not seem to cause any change in the ratio or proportion in which the constituents are produced. Under the conditions of their formation, the simple aromatics, once formed, resist further degradation and escape from the system intact. Xylene under test conditions can be recovered in excess of 90% of the original amount used, as Fig. 2 shows. In it are summarized a group of experimental runs in which various cuts or materials of different origin are placed on a comparative basis to indicate the yields of synthetic aromatics. In all the work no material was found below benzene, and no low-boiling paraffins were noted; this is interpreted as proof of aromatic ring stability under the cracking conditions. Each of the curves in Fig. 2 represents a stock which was catalytically cracked with 5% by weight of aluminium chloride.

It is of economic importance that the synthetic aromatic production is centred in the toluene and xylene ranges, as noted by the majority of the curves overlapping in the range of 105-150° C. Within this range the variation is due to the fundamental structure of the raw materials used which pre-determine, to a definite degree, the synthetic end products.

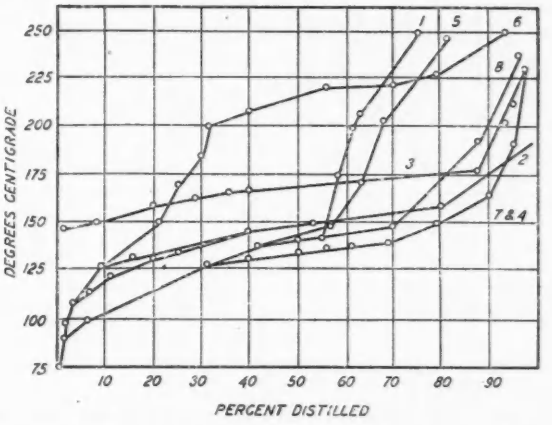


FIGURE 2. DISTILLATION RANGES OF SYNTHETIC AROMATICS FROM VARIOUS CRACKING STOCKS

1. Fraction distilling between 275–300° C.
2. Commercial 10° xylene
3. Coumarone-indene dimer oil
4. Fraction distilling between 300–360° C.
5. Steam distillate from motor benzene residue
6. Fraction distilling between 200–250° C.
7. Steam distillate from toluene residue
8. Steam distillate from xylene residue

The cracking stocks for curves 3 and 6 are of different structure and hence are not responsive to cracking as is postulated for the remaining oils. This is indirect confirmation that these low polymers are not of the "aromatic-unsaturate" type of structure. The ratio of these synthetics is close to 1, 5, and 50 parts of benzene, toluene, and xylene, respectively. This is a fortunate and timely reversal of the usual ratio in which the standard aromatics have previously been produced. The tapping of this waste material and its conversion promises to provide industry with the more desired and higher boiling aromatics. The use of mixed cracking catalysts, to provide ring opening, offers some possibility of obtaining higher alkyl aromatic derivatives.

The process in general is one of pseudo-synthesis. It is not one of simple regeneration, and is synthetic to the extent that the various fragments are subjected to a re-combination and produce aromatics which are not identical with those initially involved in the washing step.

Literature Cited

(1) Carmody, W. H., *Ind. Eng. Chem.*, **29**, 576 (1937).
(2) Carmody, W. H. (to Neville Co.), U.S. Patents, 2,143,474 (Jan. 10, 1939), and 2,149,577 (March 7, 1939).
(3) Kraemer and Spilker, *Ber.*, **123**, 3169, 3269 (1890).

GRADING OF MATERIAL*

IN their Institution of Gas Engineers Paper on Reactive Gas Coke, Messrs. Thomas and Askey discussed its possible use in mobile gas producers. Referring to the question of grading—a very important consideration—they called attention to a method of crushing which has been shown to give high yields of closely-graded material. This method was described by Mr. W. F. Carey in the Proceedings of the Institution of Mechanical Engineers, Vol. 141, No. 6, and we are indebted to the Institution for permission to publish this description. It took the form of a written communication to a discussion on crushing.

The problem of crushing material so that a maximum proportion of the product would be between certain size limits, wrote Mr. Carey, was not uncommon. When the upper limit greatly exceeded the lower, quite ordinary crushers would give a high recovery of correctly sized material. This was illustrated by Fig. 1, which gave a sizing diagram for freely crushed material, such as would be produced by ordinary well-designed rolls.

The diagram was representative—e.g., it was assumed that if the powder were graded according to size, then the weight smaller than any given grade was proportional to the size of that grade From data he had already published† it would be seen that this was not strictly true, as it was affected by the type of material and its size to an extent indicated by the dotted lines on Fig. 1; however, it represented a convenient approximation to the truth, and the inaccuracies would not affect the present purpose.

Now when it was desired to crush material so as to recover as much as possible between certain sizes, the gap of any standard

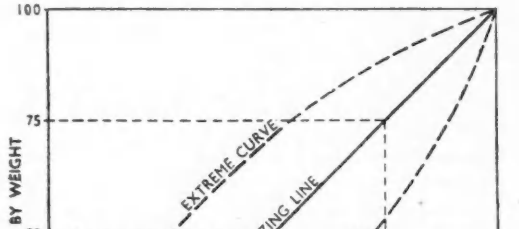


Fig. 1.—Typical Sizing Diagram for Freely Crushed Material

The abscissæ denote particle diameter and are expressed in units of arbitrary scale, so that the largest fragment has a diameter of 100 units; the ordinates show the weight percentage of particles whose diameter is less than that of the corresponding abscissæ

design of rolls could be set so that all the largest particles would just pass the upper size limit. From the diagram (Fig. 1) it would be seen that if the lower size limit was 25% of the upper, 75% of the product was recovered; but if the lower size limit was increased to 75% of the upper, the recovery efficiency dropped to the disastrous figure of 25%. Little improvement was likely if ordinary methods of crushing were employed because it was believed that free crushing represented the natural breakdown of the material and gave a minimum of fines. Other methods, such as crushing in deep beds, would certainly increase the proportion of fines and so make matters worse.

It seemed that ordinary rolls would give high recoveries when the ratio between the upper and lower limits was 5/1 or 6/1. If, however, the material was to be sized between limits proportioned as 2/1 or less, there would be considerable losses. What was wanted to reduce these was a method of crushing which would chip off the corners of the particles gently without shattering, until they just passed the aperture of the sieve which represented the upper sizing limit. This result was secured by gently crushing, between rolls, a ribbon four or five particles thick, somewhat as a steam roller dealt with rubble. An example would serve to illustrate the method of securing this effect.

Assuming that it was desired to obtain a maximum recovery of particles sized between 500 and 1,000 microns‡ (the range being denoted thus: $-1{,}000\mu + 500\mu$). The material was first fed on to a double-decker vibratory screen. The $-1{,}000\mu$ fraction would pass through the screen and join the fines and product according to its sizing. The $+1{,}000\mu$ fractions were recircu-

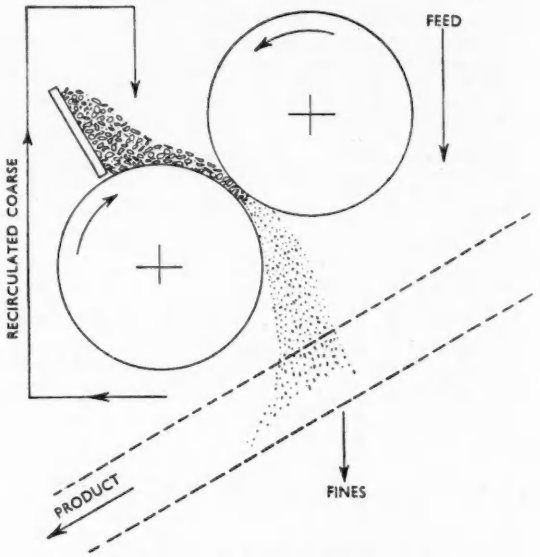


Fig. 2.—Diagram Showing Choke-Fed Rolls

lated to the rolls. Here they formed a "reservoir" which was held on the outer surface of the lower roll and overflowed in a ribbon to the rolls. The gap between the rolls was set so as to compress the ribbon from, say, five particles deep to four and so

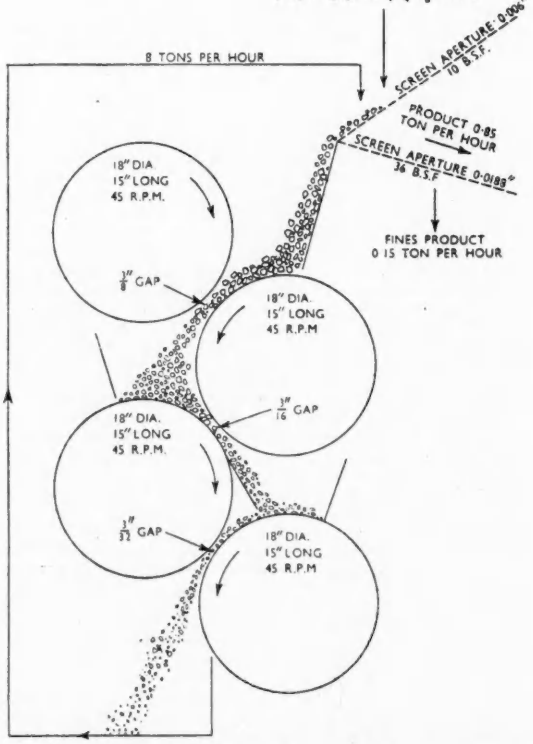

1 TON PER HOUR, - 1/4" + 1/8" MAINLY
8 TONS PER HOUR
SCREEN APERTURE 0·094" 10 B.S.F.
PRODUCT 0·85 TON PER HOUR
SCREEN APERTURE 0·0198" 36 B.S.F.
FINES PRODUCT 0·15 TON PER HOUR
18" DIA. 15" LONG 45 R.P.M.
1/8" GAP
18" DIA. 15" LONG 45 R.P.M.
1/16" GAP
18" DIA. 15" LONG 45 R.P.M.
1/32" GAP
18" DIA. 15" LONG 45 R.P.M.

Fig. 3.—Diagram of Roll Crusher Embodying Two Precrushings followed by One Choke-Fed Stage

form fines by rubbing the corners off the particles. These fines were removed by the screens, and when the primary particles were sufficiently reduced they joined the product.

If now for any reason the feed became coarser, this would

* From Vol. 141, No. 6, Proceedings of The Institution of Mechanical Engineers.

† Carey, W. F., and Bosanquet, C. H., Jl. Soc. Glass Technology, 1933, vol. 17 p. 384.

‡ 1 micron (μ) = 0.001 mm. = 1 inch ÷ 25,400.

increase the amount of oversize recirculated, and therefore the depth of the ribbon fed to the rolls. The gap between the rolls remained constant, and therefore subjected the deeper bed to more crushing, which would increase the proportion of fines in the stream of material fed to the screen. This would reduce the amount of coarse recirculated until a balance was reached between the two tendencies.

Experiment had demonstrated that if a reservoir of material was provided at the lower roll sufficient to outweigh other accumulations in the circulating system, it was not difficult to secure self-regulation. Failure to do so might entail the services of an extra attendant if maximum recoveries were desired.

An experimental set of rolls 18 in. diameter by 3 in. wide had been constructed and had demonstrated that the system was applicable to most brittle solids such as coal, granite, anhydrite, and soft amorphous materials. The power consumed was a fraction of a horse-power per ton, and wear seemed to be very slight, so that in many cases there was probably no need to use hardened roll surfaces.

Only one full-scale machine had been constructed and run; it had been installed for crushing a soft amorphous material originally sized between ¾ in. and ⅜ in. (denoted by − ¾ in. + ⅜ in. or − 19,000μ + 9,500μ) so as to give a maximum recovery (− 1,675μ + 420μ). In practice recoveries up to 85% had been achieved. Fig. 3 was a diagram of the full-scale machine. From this it would be seen that the rolls were arranged in a manner convenient for combining the precrushing and choke-fed stages. Some precrushing was necessary to avoid feeding very large particles to the final choke-fed stage where they would be subjected to excessive reductions. This might cause them to form aggregates which entailed heavy stresses and wear, and the production of excessive fines. To ensure small reduction ratios, two precrushing stages with a 2/1 reduction ratio were employed: the feed oversize, together with the recirculated oversize, were fed together through them. They ran at the same speed as the final stage, and since their gaps were at least twice as great, they crushed only the large particles which projected above the ribbon. Thus recirculated material escaped all crushing in the precrushing rolls, and was crushed only in the final choke-fed rolls together with the products from the precrushing stages. A disadvantage of this system was that the fines formed in precrushing the feed were present in the choke-fed stages. However, with the large recirculating loads employed (at least eight times the feed) this point was probably not important.

MARKETING COKE IN VANCOUVER

Abstract from the *Canadian Gas Journal*

By

HUGH GRACE

Chief Coke Salesman, B.C. Electric Power and Gas Company, Ltd., Vancouver, B.C.

IN attempting an outline of this problem, it is necessary to mention the influence of certain local factors on this question; such as the extensive use of fuel oil, the advent of automatic stokers, the development of the utilization of mill waste for heating and cooking by means of sawdust burners and also the extremely mild winter weather of this region. To a great extent these conditions are peculiar to British Columbia, and their influence on the local fuel market is important.

Our ovens have a maximum annual "for sale" production of approximately 40,000 tons of Gas Chamber coke. It is of a high ash variety (over 15%) the fusion point of which is relatively low (2,340° F.), although the structure can be considered good and uniform.

The coke is prepared for sale in the following sizes: Lump, over a 2½ in. screen; Egg, minus 2½ in. plus 1⅝ in.; Nut, minus 1⅝ in. plus 1 in.; Pea, minus 1 in. plus ⅜ in.; Screened breeze, minus ⅜ in. plus ¼ in., Breeze, minus ¼ in.

Our price range is: $10.75 per ton for Lump and Egg sizes, $9.75 per ton for Nut, $8.75 per ton for Pea, with a reduction of $0.25 and $0.50 for two and four ton deliveries respectively.

Commencing April 1 of each year, special summer prices are made available for lots from two tons up, with budget plan payments to induce customers to fill their bins when delivery conditions are ideal. The summer price reduction starts with a discount of $1.50 per ton, but is subject to an increase of $0.15 per ton each month until September 30, after which regular prices prevail. During September the special discount, which by then is $1.00 per ton, is extended to purchases of one ton lots also.

Frequent experiments have been made with Screened Breeze and Pea coke mixed in different proportions with coal, in the many makes of automatic stokers, principally of the worm underfeed type. These experiments failed because the harsh abrasive action of the brittle coke on the feed worm caused hard wear, and the low temperature fusion of the coke ash produced excessive clinkering.

Fine Breeze, as such, we have been unable to market as a fuel. A partial solution of the question was found some years ago by the erection of a briquetting plant. Now a considerable quantity of Fine Breeze is used as raw material in the making of briquets, which we are able to dispose of with some measure of success.

Market

Our local market consists of approximately 75,000 homes, which we classify as domestic. Office buildings, apartment and hotel buildings, merchant stores and business premises generally where coke may be used strictly for heating requirements, are classified as commercial. Industrial users are classified as such where coke is used for industrial purposes only.

Several years ago, oil made great inroads in our local fuel market, and has since become well established as a fuel, especially in the commercial and industrial field. This was probably due to the automatic features of oil burning, which make its use so convenient. With the introduction of smaller sizes of coal stokers, however, coal has also become a means of convenient plant operation by automatic control.

Among home owners, large numbers have turned to sawdust as a fuel for heating and cooking purposes. Despite the many disadvantages the sawdust burners' semi-automatic features, the small amount of ash and the apparent cheapness of operation attract this class of buyer. Mill-wood still remains the chosen fuel of many people, and is used extensively the whole year round. Even coke users are apt to burn wood in preference to coke for mild weather furnace operation. The reasons given by these customers are that during mild weather a constant fire is not required, and that coke is not suitable for intermittent fires. Our educational programme is overcoming this to some extent, but there remains a lot of work still to be done in this direction.

The following analysis of fuels used for residence heating shows clearly the customer acceptance for coke and competing fuels. This data were obtained by our servicemen in a house-to-house canvass. One thousand five hundred calls and enquiries were made in representative sections of the city. The results were:

Coke	16.2%
Sawdust	37.5%
Coal	13.6%
Wood	24.6%
Coal Stokers	2.2%
Oil	5.2%
Miscellaneous	0.7%
	100.0%

If we eliminate automatic and semi-automatic appliances we find that coke is used in approximately 30% of hand-fired installations, coal in 25%, and wood in 45%.

Service

Our service work covers the whole of the local territory, which is divided into three districts, with a serviceman in each. The servicemen's duties consist of personal contact at least once a year with all old customers, to check on the condition of their appliances and their methods of firing.

To all new customers instruction cards are mailed on the day of delivery. The following day a telephone call is made to check the results. If trouble is apparent, the district serviceman is dispatched to take care of it. The customer is also advised of the desirability of the installation of a solid key damper in the flue pipe, to ensure better furnace control. As most furnaces are not equipped with this device, for a nominal charge we arrange to instal one ourselves. Key dampers, we have found, aid materially in the efficiency of coke burning, and we regard it as essential that one be installed.

During the period of special summer prices, the servicemen are employed in telephoning customers to get orders and arrange terms. Where sales resistance is offered, personal calls are made to determine the reason for the customer's unwillingness to reorder. In this work they are assisted by the chief serviceman.

During the winter season, all of the servicemen's time is occupied by giving service to the many new customers brought in by advertising. Their whole winter efforts are directed towards making permanent satisfied coke users of these new customers.

Our advertising programme is arranged to meet the different seasonal requirements, and practically all media are used.

Just prior to the period of special summer prices, a card is sent to all customers telling them of the new prices and soliciting their order. These cards are sent out each month thereafter, until the end of the campaign. Space is also used during this period in the Company's Consumers' magazine. In addition, newspapers are used during September to advertise the $1.00 off special.

During the month of October or November, depending on weather conditions, a direct-by-mail appeal is made to all home owners in the form of a special introductory trial order of 200 lb.

delivered, with a reduction of possibly ten cents per hundred.

Inside and outside street car cards are used throughout the winter season. One large electric sign is maintained throughout the whole year, in a section of the city traversed by thousands of people daily. Newspaper advertising and radio announcements are reserved mostly for cold weather purposes, and with the appearance of low temperatures are used extensively.

For several years now we have employed screen advertising in suburban movie houses. Three forms of appeal were used. The earlier films were all based on instructions on how to burn coke correctly. Later, we adopted films explaining what coke is and how it is made. This last season's films were worked out on the testimonial idea, featuring important buildings heated with coke.

Selling

Personal selling is mainly confined to the commercial and industrial field. Here the picture is different to that of the domestic field, where advertising is relied upon for the bulk of new business. Advertising affects commercial and industrial business to a limited degree only, and personal selling, therefore, has to be undertaken. While questions of convenience are paramount among home owners, shrewd commercial buyers are concerned mostly with economic plant operation. This sales work is done by the chief salesman, assisted by the chief serviceman as far as service is concerned.

Service work with commercial and industrial users is more complicated and thorough, and may involve the taking charge of a whole plant. This has often become necessary where the methods of firing with coke were quite foreign to the fireman who had had no previous experience with this fuel.

Some years ago our local dealers were approached in an endeavour to employ their co-operation with a view to marketing our coke through them. The gesture was doomed to failure at the outset, as the dealers were not prepared to give service and instruction to customers. Later, we offered to supply this service ourselves, but they nevertheless declined to accept, on the grounds that it would entail them supplying us with a record of their customers. As they were unyielding, we were obliged to carry on ourselves. Now the price to dealers at the bunkers has been set to give them a hauling allowance only.

Our most serious problem always has been to keep coke production and sales balanced. The quantity of coke available for sale depends largely on the amount of gas manufactured. Several times during the last fifteen years the stocks have run so low that we have had to curtail sales. Often, however, we have been unable to move sufficient coke during an extremely mild winter to keep our stocks from growing too large.

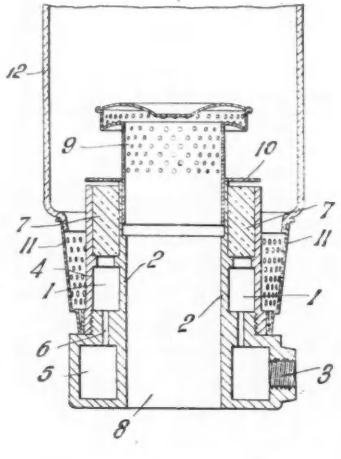
A much more rapid rate of growth of sales could be easily obtained if we greatly improved the quality of our coke. High freight rates on coals suitable for the manufacture of such an improved coke as well as other economic considerations have so far made it inadvisable for us to proceed along this line.

The other alternative left to us is to limit the production of coke if possible in such a way that the production cost per 1,000 cu.ft. of gas is not increased. In the past we have had to fall back on the use of our carburetted water gas plant to use up surplus coke, and had to submit to higher operating costs. Since the erection of the Gas Chambers plant, and the invention of the Triple process by our Gas Engineer, we have had available to us a more economical means of curtailing coke production when required. Just lately, Mr. Keillor has commenced experiments with the carbonization of saw mill waste, and indications are that in that direction lies the solution of this vexing problem of coke stock control.

Our policy of merchandizing coke is based on an attempt to sell the highest possible percentage of available tonnage at the highest possible net per ton. We are endeavouring to build up coke sales in an orderly fashion, to a point where even during a mild winter, our total tonnage available for sale can be moved at a profitable price.

Gas Burner Patent

Radiant Heating, Ltd., and Arthur Docking have been granted a patent (No. 522,309; application date, Feb. 1, 1939) for a gas burner, illustrated in the accompanying diagram. The annular gas chamber 1 is formed by a hollow cylindrical metal casting 2, having at its lower end an outwardly projecting flange provided with a gas inlet passage 3, and by a second hollow cylindrical metal casting 4 open at both ends and secured at its lower end to the flange on the member 2 by means of a screw thread. The flange of the member 2 is formed with an annular passage 5 communicating with the gas inlet 3 and a plurality of holes 6 connect this passage to the upper surface of the flange between the cylindrical members 2 and 4. The upper end of the gas chamber 1 is filled with porous refractory brick 7, which is supported on flanges which project outwardly and inwardly respectively from the members 2 and 4. The gas entering through the inlet 3 passes to the passage 5, by which it is distributed uniformly around the device, thence flows through the holes 6 into the chamber 1 and thence through the brick 7 from the upper surface of which it escapes as an annular jet.



The extension of the central air tube 8 above the level of the gas outlet is formed by a hollow sheet-metal distributor member 9 of approximately T-shaped cross section, the cylindrical walls of both the smaller lower and the larger upper portions of this member being formed with numerous small perforations. An outwardly projecting flange 10 carried by the member 9 projects over the top of the refractory brick 7 and deflects outwardly the gas issuing from it.

The outer casing of the burner comprises a perforated, open-ended sheet metal member 11, adapted at its upper end to receive and support a chimney 12 and formed at its lower end with an inwardly projecting, upturned flange adapted to engage resiliently the outer surface of the member 4 of the annular gas chamber.

Carbonization Under Pressure

Among the new patents is one granted to The Institution of Gas Engineers and F. J. Dent (No. 522,640; application date, Dec. 16, 1938). It relates to carbonization under pressure. The patentees point out that in Specifications Nos. 491,453 and 27772 of 1938 (Serial No. 503,183) they described a process whereby gases containing a high proportion of methane are obtained by the action of hydrogen or gases containing hydrogen under a pressure substantially above atmospheric pressure on coal and other carbonaceous materials at a high temperature, which during at least a part of the process is about 800° C. or higher. The hydrogen or gases containing hydrogen required for the process may be obtained by gasification of the solid residue of the process with steam and air or oxygen, as described in Specification No. 28120 of 1937 (Serial No. 503,158). If, however, it is desired to export the solid residue from the works as a marketable coke, hydrogen or gases containing hydrogen must be supplied from an extraneous source.

According to the present invention, hydrogen required for the process is provided by reaction between steam and gas rich in methane produced by the process. Thus a part of the gas rich in methane leaving the hydrogenation vessel may be passed while still under pressure into a reaction chamber, to which are supplied steam and oxygen, the latter for providing the necessary high temperature by partial combustion of the gas. The gas leaving the reaction chamber or chambers, consisting substantially of a mixture of hydrogen, carbon monoxide, carbon dioxide, undecomposed steam, and undecomposed methane, is freed from steam and carbon dioxide, and the purified gas, consisting largely of hydrogen, is supplied to the hydrogenation vessel.

The reaction between the methane and steam may be promoted by the presence of a catalyst.

The gas rich in methane may be preheated before it enters the reaction chamber or chambers by heat exchange with the gas leaving the reaction chamber or chambers.

The invention, state the patentees, improves the flexibility of the process described in Specifications Nos. 491,453 and 27772 of 1938, since the relative amounts of coke and available gas produced can be varied within wide limits according to requirements by varying the degree of hydrogenation of the carbonaceous material, and this without need for supply of extraneous hydrogen apart from that which may be required for commencing the process. Thus hydrogenation may be restricted so that the carbonaceous material loses little more than its content of volatile matter and a maximum yield of coke is obtained. On the other hand, a maximum yield of combustible gas can be obtained by carrying the hydrogenation substantially to completion. In the latter case, substantially complete hydrogenation can be facilitated by use of a catalyst, such as an alkali, as described in Specification No. 10131 of 1938 (Serial No. 514,302).

When hydrogenation is restricted so that a high or maximum yield of coke is obtained, only a relatively small proportion of the methane need be decomposed and correspondingly less oxygen need be supplied to the reaction chamber. In these circumstances, the

(*Please turn to page 171.*)

Products Prices

The London Market

July 22.

The prices of tar products generally remain unchanged at the following levels: Owing to lack of Continental demand, it is not possible to give a value for pitch. Creosote is about 4¼d. to 5d. per gallon, refined tar 3¼d. to 4d. The price of pure toluole under the Ministry of Supply Toluole No. 2 Order, 1940, is 2s. 5d. per gallon, pure benzole 1s. 10d., 95/160 solvent naphtha 1s. 11d. to 2s., and 90/160 pyridine about 18s. 6d., all per gallon naked. Refined naphthalene crystals, £23 per ton in bags, all *ex* makers' works.

The Provinces

July 22.

The average prices of gas-works products during the week were: Pitch.* Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 9d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¾d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's. 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* Pitch.—Owing to the Export Trade being at a standstill due to the position in France it is practically impossible at the moment to quote a market price for pitch. For the same reason no quotation can be given for crude gas-works tar.

Scotland

GLASGOW, July 20.

Keener prices are being quoted for some products, and a steady throughput is maintained in all departments.

Refined tar.—Quite substantial quantities are changing hands, with price in the home market at 4¼d. to 4½d. per gallon and in the export market at 3½d. per gallon, both f.o.r. naked.

Creosote oil.—On the basis of business recently placed to-day's prices are as under: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6d. to 6¼d. per gallon; neutral oil, 5¾d. to 6d. per gallon; all *ex* works in bulk.

Cresylic acid.—Competition is keen for any business on the market, and prices are as under: Pale, 97/99%, 1s. 11d. to 2s. 1d. per gallon; pale, 99/100% 2s. 3d. to 2s. 5d. per gallon; dark, 97/99%, 1s. 8d. to 1s. 10d. per gallon; all *ex* works in buyers' packages.

Crude naphtha remains at 6½d. to 7½d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 9d. to 1s. 10d. per gallon, and 90/190 heavy naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

Motor benzole is 1s. 8d. to 1s. 8½d. per gallon.

Pyridine.—90/160 grade is valued at 17s. to 18s. per gallon, and 90/140 grade at 19s. to 20s. per gallon.

Change of Address

The Airscrew Co., Ltd., of Weybridge, manufacturers of fans, ventilators, air conditioning plant, and cooling tower equipment, have transferred their sales department to Grosvenor Gardens House, London, S.W.1 (Telephone: Victoria 4527). All inquiries for Air-screw fans and "Jicwood" products should now be sent to the London address. Despite war conditions good progress is being made in the development of ventilating and air conditioning fans for every industry.

Dividends Announced

Commercial Gas Company

The Directors of the Commercial Gas Company have declared dividends as follows:

On the 4% redeemable preference stock 1960/63 a dividend for the half-year to June 30, 1940, at the rate of 4% per annum (less income-tax), payable Sept. 1.

On the ordinary stock, an interim dividend on account of the year ending Dec. 31, 1940, of 1½% (less income-tax), payable Aug. 15. This compares with an interim dividend of 2% (less income-tax) in 1939.

Vickers, Limited

At a meeting of the Board of Vickers, Ltd., held on July 18, the undermentioned interim dividends were declared: 2½% actual, less income-tax, on the preferred 5% stock; 2½% actual, less income-tax, on the 5% preference stock; 2½% actual, free of income-tax up to 6s. in the £ on the cumulative preference stock. Payment will be made on Aug. 23, 1940.

Trading Result

W. and T. Avery

Profit after reserve for taxation, £207,715 (£221,367). Net, after depreciation, &c., £151,098 (£165,348); 10%, making 15%, and pensions reserve, £10,000 (same); general reserve, £30,000 (£45,000); contingency (war) reserve, £25,000 (nil); forward, £65,207 (£70,890).

Gas Undertakings Results

Bourne

Sales during the past financial year by the Bourne (Lincs.) Urban District Council gas undertaking show a decrease of about 7½% when compared with those of the preceding twelve months. After meeting the various charges, there is a net deficit on the working of £108, as against a profit of £189 for the previous year. There has been a drop of £260 in receipts for street lighting.

Keighley

The total quantity of gas delivered by the Borough of Keighley Gas Department during the twelve months to March 31 was 454,685,000 cu.ft., which is a decrease of 12,623,000 cu.ft. when compared with the sales of the preceding year. This small decrease is much more than accounted for by the fall of 75% in the public lighting load, from 36 million cu.ft. to 9 millions—a loss of 27 million cu.ft. Thus, with the exception of public lighting, a substantial increase has been secured in the volume of gas supplied during the year. As a matter of fact, ignoring public lighting, the increase in gas sold amounts to 19,249,773 cu.ft. Prepayment consumers took considerably more gas than domestic and power users by ordinary meter combined. At the end of March, 5,046 consumers had ordinary meters, while 11,100 were provided with prepayment meters. The average consumption per ordinary meter was 36,375 cu.ft., and per prepayment meter 18,755 cu.ft. The total number of consumers at the end of the period was 16,146, as against 16,179 a year ago. A net profit of £2,884 compares with a loss of £9,870 a year ago. Wages of stokers, due to the substitution of vertical retorts for horizontals, show a decrease of £1,447, and the gas made per ton of coal an increase from 14,552 cu.ft. to 17,560 cu.ft.

A.R.P.

PROTECTION OF SANDBAGS.

METRO CREOSOTE EMULSION

METRO COPPER CREOSOTE EMULSION

Both Emulsions conform to the Specification of the Ministry of Home Security Memorandum A.R.P. 279/1939 — 20/10/39, and are available in GREEN at slight additional cost.

SOUTH METROPOLITAN GAS CO.

REGIS HOUSE, KING WILLIAM STREET, E.C.4.

Telephone: AVENUE 2755.

For every size of works and every class of coal...

WEST'S

CARBONIZING PLANTS

GLOVER-WEST VERTICALS

WESTVERTICAL CHAMBERS

440 carbonizing plants have been built or are under construction by West's in 24 countries. Working results from a wide variety of gas coals have established the high efficiency and adaptability of the West systems.

WEST'S

GAS IMPROVEMENT CO · LTD ·

MILES PLATTING MANCHESTER 10

TELEPHONE—COLLYHURST 2961-2-3-4-5 · TELEGRAMS—STOKER, MANCHESTER

LONDON OFFICE TEMPORARY ADDRESS—BATH ROAD · HARMONDSWORTH · WEST DRAYTON · MIDDLESEX TEL.—WEST DRAYTON 2288-9

GAS STOCKS AND SHARES

Steadiness was the key note in all sections of the Stock Exchange last week, although the volume of business was very limited. The latter was due of course to the proximity of the supplementary Budget and by the time this copy of the "JOURNAL" is published we shall be fully aware of its contents. Price changes on the whole were small and in the gilt-edged market quotations generally remained the same as a week ago—2½% Consols being only ¼ down at 72. Home rails cheered up towards the close, L.M.S. 1923 preference being a speciality. There was very little selling of industrial shares, although any price changes showed a slightly downward tendency. Oil and rubber shares remained dull, but goldmining shares received some support and were firm at the close.

There was a fair amount of business in the Gas Market and, leaving out the *ex* div. markings, price changes were fewer last week. Gas Light units and South Metropolitan were again the only ordinary stocks to show improvement and both appreciated by the same figure as the previous week. Among the falls, Plymouth and Stonehouse suffered the heaviest with a drop of 10 points to par, business being recorded at 99½ against the previous transaction at 116 a little over a month ago. Tottenham fell 4½ to 85, and it will be seen that the two Brighton stocks also reacted. Imperial Continental is now on offer at 35. The only fall of note on the Provincial Exchanges was that of Newcastle units which closed 1s. 6d. down at 16s. 6d. No changes of importance were made to the nominal quotations in the Supplementary List.

Interim dividend announcements are now appearing and among these announced so far only one is maintained at the previous year's level. The Commercial is distributing 1½% against 2%, South Suburban 2% against 3%, and Watford 2½% against 3%. Cardiff pays 3%, the same rate as a year ago.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 19.	Rise or Fall on Week.
1,767,439	Mch. 11	8	7	Alliance & Dublin Ord. ...	90—100	...
374,000	July 1	4	4	Do. 4 p.c. Deb. ...	90—95	...
957,608	May 13	5	5	Ascd. Gas & Water U'd'ts Ord.	12/—14/-	...
500,000	"	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/6—17/6	...
535,545	"	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
336,646	"	4	4	Do. 4 p.c. Irred. Cum. Pref.	12/6—14/6	...
750,000	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87	...
560,070	Feb. 19	7	7	Barnet Ord. 7 p.c.	115—120	...
300,000	Apl. 8	1/4⅜	1/9⅜	Bombay, Ltd.	19/6—21/6	...
181,915	Feb. 26	9½	9½	Bournemouth Sliding Scale ...	145—150	...
690,526	"	7	7	Do. 7 p.c. max. ...	117—122	...
493,960	"	6	6	Do. 6 p.c. Pref. ...	115—120	...
50,000	June 17	3	3	Do. 3 p.c. Deb. ...	65—70	...
362,025	"	4	4	Do. 4 p.c. Deb. ...	90—95	...
335,000	"	5	5	Do. 5 p.c. Deb. ...	95—100	...
357,900	Feb. 19	7½	6¾	Brighton, &c., 6 p.c. Con. ...	100—105	−3
659,955	"	6¾	5⅞	Do. 5 p.c. Con. ...	85— 90	−5
205,500	"	6	6	Do. 6 p.c. 'B' Pref. ...	103—108	...
855,000	Mch. 11	7	8	British Ord.	82—92	−3
100,000	June 17	7	7	Do. 7 p.c. Pref.	112—117	...
350,000	"	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	"	4	4	Do. 4 p.c. Red. Deb.	75—80	...
450,000	"	5	5	Do. 5 p.c. Red. Deb.	93—98	...
100,000	22 May '33	6	4	Cape Town, Ltd.	¼—¾	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	¼—¾	...
150,000	June 17	4½	4½	Do. 4½ p.c. Deb.	52—57	...
626,860	July 15	5⅞	6	Cardiff Con. Ord.	89—94*	−3½
237,860	June 17	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
98,936	Apl. 8	2/-	2/-	Colombo Ord.	1½—1½	...
24,510	"	1/4½	1/4½	Do. 7 p.c. Pref.	19/6—21/6	...
739,453	Mch. 26	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/6—16/6	...
296,144	"	1/3.30	1/3.30	Do. 8 p.c. Pref.	20/—22/-	...
1,748,935	Jan. 29	4	2	Commercial Ord.	37—42	...
140,000	Feb. 19	4	4	Do. 4 p.c. Red. Pref. ...	87—92	...
620,000	June 10	3	3	Do. 3 p.c. Deb.	58—63	...
286,344	Feb. 19	5	5	Do. 5 p.c. Deb.	90—95	...
200,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	90—95	...
807,560	Feb. 12	7	7	Croydon sliding scale	88—98	...
644,590	"	5	5	Do. max. div.	82—87	−3
620,385	July 1	5	5	Do. 5 p.c. Deb.	90—95	...
208,660	Feb. 19	5	5	Dudley, Brierley Hill & Dist. Ord.	98—103	...
82,275	"	5	5	Do. 5 p.c. Con. Pref. ...	93—98	...
79,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
239,000	Jan. 29	5	88/6	East Hull Ord. 5 p.c.	70—80	...
187,215	Feb. 12	5⅛	5⅛	East Surrey Ord. 5 p.c. ...	93—98	...
176,211	June 17	5	5	Do. 5 p.c. Deb. ...	92—97	...
250,000	July 8	4	6	Gas Consolidation Ord. 'B' ...	13/—15/-	...
250,000	May 13	4	4	Do. 4 p.c. Red. Cum. Pref.	15/—17/-	...
19,152,410	Jan. 29	5⅜	3⅜	Gas Light & Coke Ord. ...	12/3—13/3a	+/-3
2,600,000	"	3½	3½	Do. 3½ p.c. max.	55—60	...
4,477,106	"	4	4	Do. 4 p.c. Con. Pref. ...	77—82	...
2,993,000	July 8	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	78—83	...
8,602,497	June 3	3	3	Do. 3 p.c. Con. Deb. ...	62—67	−1
3,642,770	"	5	5	Do. 5 p.c. Red. Deb. ...	99—104	...
3,500,000	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	95—100	...
700,000	Mch. 11	3½	3½	Do. 3½ p.c. Red. Ded. ...	80—85	...
270,466	Feb. 19	6	6	Harrogate New Cons.	93—98	...
157,500	Apl. 8	‡1/-	‡1/-	Hong Kong and China Ord. ...	¼—¾	...
5,600,000	May 13	4	8	Imperial Continental Cap. ...	28—38	−2
172,810	Jan. 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	64—69	...
63,480	June 24	3	3	Maidstone 3 p.c. Deb.	54—59	...
45,000	June 10	†8	†10	Malta & Mediterranean Metropolitan (of Melbourne) ...	88—98	...
392,000	Apl. 1	5½	5½	5½ p.c. Red. Deb.	95—100	...
231,977	Feb. 19	5	5	M.S. Utility 'C' Cons.	75—80	...
968,658	"	4	4	Do. 4 p.c. Cons. Pref. ...	77—82	...
390,076	June 24	4	4	Do. 4 p.c. Deb. ...	85—90	...
148,955	June 24	5	5	M.S. Utility 5 p.c. Deb. ...	95—100	...
125,000	July 1	3½	3½	Do. 3½ p.c. Red. Bds. ...	87—92	...
675,000	May 6	†4	†4	Montevideo, Ltd.	55—60	...
250,000	Mch. 18	7½	5.7/10	North Middlesex 6 p.c. Con. ...	103—108	...
396,160	Jan. 29	5	5	Northampton 5 p.c. max. ...	97—102	...
300,000	Apl. 29	9	7	Oriental, Ltd.	108—113	...
468,537	June 3	7	8	Plymouth & Stonehouse 5 p.c.	95—105	−10
621,667	Feb. 5	8⅛	8⅛	Portsmouth & Gosport Cons.	100—105	...
241,446	"	5	5	Do. 5 p.c. max.	75—80	...
73,350	"	5	5	Do. 5 p.c. Pref.	87—92	...
75,000	"	4	4	Do. 4 p.c. Pref.	70—75	−2
114,000	Feb. 5	5	5	Preston 5 p.c. Pref. ...	88—93	...
247,966	June 17	4	4	Primitiva 4 p.c. Cons. Deb. ...	91—96	...
625,959	July 15	4	4	Do. 4 p.c. Red. Deb. ...	90—95*	−1
15,000	Mch. 11	6	6	San Paulo 6 p.c. Cum. Pref. ...	4½—6½	...
441,275	Apl. 29	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	14/—16/-	...
460,810	Mch. 11	-/10⅛	-/10⅛	" " 4½ p.c. Cum. Pref. ...	16/—18/-	...
133,201	Feb. 12	8½	5	Shrewsbury 5 p.c. Ord. ...	105—115	...
1,996,297	Apl. 29	1/2⅜	1/-	South African Ord.	3½—4½	...
1,000,000	Mch. 4	-/10½	-/10⅜	South East'n Gas Cn. Ld. Ord.	11/—13/-	...
769,191	"	4	4	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
450,000	Feb. 12	4	4	Do. 4 p.c. Cum. Pref. ...	13/—15/-	...
150,000	"	3½*	3½	Do. 4 p.c. Red. Deb. ...	95—100	...
6,709,895	"	5	4	Do. 3½ p.c. Red. Deb. ...	89—94	...
1,135,812	"	6	6	South Met. Ord.	39—44	+1
850,000	"	4	4	Do. 6 p.c. Irred. Pref. ...	100—110	...
1,895,445	July 1	3	3	Do. 4 p.c. Irred. Pref. ...	72—77	−6
1,000,000	July 15	5	5	Do. 3 p.c. Deb.	60—65	...
600,000	"	3⅜	3⅜	Do. 5 p.c. Red. Deb. ...	95—100*	−2
1,543,795	Feb. 5	6	3	Do. 3⅜ p.c. Red. Deb. ...	91—96*	−1
512,925	July 8	5	5	South Suburban Ord. 5 p.c. ...	60—70	...
500,000	"	4	4	Do. 5 p.c. Pref.	88—93	...
250,000	"	3⅜	3⅜	Do. 4 p.c. Pref.	71—76	...
888,587	June 10	5	5	Do. 3⅜ p.c. Red. Pref. ...	80—85	...
250,000	"	4	4	Do. 5 p.c. Deb.	95—100	...
200,000	Feb. 12	3½	3½	Do. 4 p.c. Deb.	85—90	...
427,859	Apl. 15	-/9⅜	1/2⅜	Do. 3½ p.c. Red. Deb. ...	87—92	...
160,523	"	-/10½	-/10⅜	S. Western Gas & Water Ord.	13/—15/-	...
110,000	June 17	4	4	Do. 4½ p.c. Red. Cum. Pref.	15/—17/-	...
750,541	Feb. 5	5	5½	Do. 4 p.c. Red. Deb. ...	85—90	...
148,836	June 17	4	4	Southampton Ord. 5 p.c. ...	73—78	...
350,000	Feb. 12	5½	5½	Do. 4 p.c. Deb.	82—87	...
200,000	June 24	3½	3½	Swansea 5½ p.c. Red. Pref. ...	97—102	...
1,076,490	Feb. 26	6½	5	Do. 3½ p.c. Red. Deb. ...	85—95	...
409,835	"	5½	5½	Tottenham and District Ord....	80—90	−4½
62,235	"	5	5	Do. 5½ p.c. Pref.	100—105	...
453,380	June 10	4	4	Do. 5 p.c. Pref.	90—95	...
1,247,505	May 20	4	6	Do. 4 p.c. Deb.	80—85	−5
1,085,952	May 13	4½	4½	U. Kingdom Gas Cor. Ord. ..	12/6—14/6	...
772,709	"	4	4	Do. 4½ p.c. 1st Cum. Pref. ...	14/—16/-	...
745,263	June 17	4½	4½	Do. 4 p.c. 1st Red. Cum. Pf.	14/—16/-	...
1,093,656	Mch. 18	3½	3½	Do. 4½ p.c. 2nd Non-Cum. Pf.	12/6—14/6	...
378,106	Mch. 11	7	7	Do. 3½ p.c. Red. Deb. ...	83—88	...
133,010	"	5	5	Uxbridge, &c., 5 p.c.	95—100	...
1,371,138	July 8	3½	4	Do. 5 p.c. Pref. ...	95—100	...
2,525,768	"	4	4	Wandsworth Consolidated ...	62—72*	...
1,343,964	June 17	5	5	Do. 4 p.c. Pref.	71—76	−1
383,745	"	4	4	Do. 5 p.c. Deb.	90—95	−3
400,000	"	3⅜	3⅜	Do. 4 p.c. Deb.	80—85	−5
558,342	July 15	6	5	Do. 3⅜ p.c. Red. Deb. ...	87—92	...
200,000	"	5	5	Watford and St. Albans Ord. ...	88—93*	5
200,000	"	5½	5½	Do. 5 p.c. Pref.	87—92*	−3
200,000	"	4	4	Do. 5½ p.c. Pref.	97—102	−3
100,000	"	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	85—90*	...
209,000	June 10	3½	3½	Do. 4 p.c. Red. Pf. (1959)	91—96*	−2
				Do. 3½ p.c. Red. Deb. ..	85—90	...

a.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations July 19.	Rise or Fall on Week
202,152	Mch. 18	5	5	Ascot Ord.	80—85	...
128,182	Dec. 27	5	5	Do. 5 p.c. Pref. ...	85—90	...
31,035	Mch. 4	-/9 5/8	-/9 5/8	Associated Utilities 4 p.c. Pref	15/—17/-	...
100,000	June 24	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
17,000	Feb. 19	8	8	Bognor Orig. Ord. 'A' ...	102—112	...
62,210	,,	8	8	Do. New Add. 'A' ...	102—112	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	95—105	...
37,440	Jan. 29	10	10	Cam. Univ. & Town 10 p.c. max.	145—155	...
125,970	,,	7	7	Do. 7 p.c. max.	100—110	...
39,025	,,	5	5	Do. 5 p.c. max.	80—90	...
96,410	July 15	4½	4½	Cardiff 4½ p.c. Pref.	85—90*	- 5
55,520	Feb. 19	6	6	Colchester 6 p.c. Pref.	100—105	...
90,550	Mch. 18	5	5	Do. 5 p.c. Deb.	95—100	...
150,000	Feb. 12	4	4	Croydon 4 p.c. Pref.	77—82	...
130,000	July 1	4	4	Do. 4 p.c. Deb.	82—87	...
65,000	Mch. 4	7½	6 5/8	Eastbourne 'A' 5 p.c.	100—105	...
198,000	,,	6	5 5/8	Do. 'B' 3½ p.c.	78—83	...
112,312	,,	5	5	Do. 5 p.c. Pref.	90—95	...
130,000	June 24	5	5	Do. 5 p.c. Deb.	95—100	...
130,500	Feb. 19	7½	7½	Exeter New Ord. (£10) ...	12—14	...
24,000	Aug. 21	8½	8½	Gt. Yarmouth 8½ p.c. max. (£30)	15—20	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	10—15	...
51,160	June 10	5½	5½	Do. 5½ p.c. Deb.	100—105	...
152,600	Feb. 26	8	9	Guildford Cons.	110—120	...
54,055	,,	5	5	Do. 5 p.c. Pref.	90—95	...
68,250	June 17	5	5	Do. 5 p.c. Deb.	95—100	...
156,600	Feb. 19	7	5	Hampton Court Cons. ...	75—85	...
86,046	June 17	5	5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/—15/-	...
80,000	Feb. 12	4	4	Lea Bridge 4 p.c. Pref.	75—80	...
60,000	,,	6	6	Do. 6 p.c. Pref.	105—115	...
94,876	June 17	4	4	Do. 4 p.c. Deb.	80— 85	- 5
73,620	Mch. 18	8½	8½	Luton Cons. 'A'	115—125	...
107,960	Feb. 26	4	5½	Mid Kent Ord. (£10)	7½—8½	...
230,940	Feb. 5	10	10	Oxford & District Ord. ...	135—145	...
47,112	,,	5	5	Do. 5 p.c. Pref.	85—90	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
126,193	May 13	7½	7½	Peterborough Ord.	138—148	...
64,990	Mch. 18	7	7	Redditch Ord.	100—110	...
166,850	Feb. 19	8	8	Romford Ord.	100—110	...
60,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
44,000	Mch. 18	5	5	Do. 5 p.c. Deb.	95—100	...
25,570	Feb. 12	5½	5½	Rugby 5½ p.c. Pref.	100—110	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
42,750	Dec. 11	5½	5½	Do. 5½ p.c. Deb.	102—107	...
110,950	Feb. 26	8	8	Ryde Ord.	100—110	...
270,086	Mch. 18	7	7	Slough Ord.	98—103	...
21,000	June 10	5	5	Do. 5 p.c. Deb.	95—100	...
28,872	May 13	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	14/—16/-	...
28,866	Mch. 18	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
127,228	Feb. 19	5	7	Swindon Cons.	75—80	...
60,425	June 24	5	5	Do. 5 p.c. Deb.	90—95	...
64,380	June 17	5	5	Torquay & Paignton 5 p.c. Pref.	83—88	...
130,000	Feb. 12	5	5	Wakefield Ord	85—95	...
81,650	,,	5	5	Do. 5 p.c. max	75—80	...
82,000	Jan. 29	6	6	Weymouth Ord.	82—87	...
273,626	Feb. 12	7	7	Wolverhampton Cons. Ord. ...	115—120	...
98,384	,,	6	6	Do. 6 p.c. Pref.	105—115	...
160,000	June 17	5½	5½	Do. 5½ p.c. Red. Deb. ...	98—103	...
106,490	Mch. 18	5½	5½	Wrexham Ord	75—85	...
90,000	June 24	5	5	York 5 p.c. Red. Deb.	94—99	...
133,640	Feb. 19	6	6	Yorktown (Cam.) 5 p.c. Cons.	82—87	...
120,000	,,	5	5	Do. 5 p.c. Pref.	85—90	...
35,000	June 17	5½	5½	Do. 5½ p.c. Deb.	103—108	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 19.	Rise or Fall on Week.
347,756	Feb. 1	5	6	Bath Cons.	100—105	...
1,667,250	July 15	5	5	Bristol, 5 p.c. max.	88—91*	- 1
120,420	June 17	4	4	Do. 1st 4 p.c. Deb. ...	94—96	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	92—95	+½
328,790	,,	5	5	Do. 5 p.c. Deb.	108—111	- 1
274,000	Feb. 26	5	5	Newport (Mon.) Ord.... ...	91—94	...
13,200	Mch. 26	7	8¾	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½	...
13,600	,,	5	6	Do. 7 p.c. 'B'	9½—10½	...
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½	...
140,778	Feb. 12	5	5	Weston-super-Mare Cons. ...	88—92	...
64,338	Dec. 27	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 19.	Rise or Fall on Week.
157,150	Feb. 5	5	6½	Chester 5 p.c. Ord.	98—101	...
92,500	June 17	4	4	Do. 4 p.c. Pref.	83—87	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	84—87	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	94—98	...
2,167,410	Feb. 19	6	6	Liverpool 5 p.c. Ord. ...	100—102	...
245,500	June 17	5	5	Do. 5 p.c. Red Pref. ...	99½—102½	...
306,083	July 15	4	4	Do. 4 p.c. Deb.	99—101*	...
106,280	Feb. 5	10	8	Preston 'A' 10 p.c.	160—170	...
188,219	,,	7	7	Do. 'B' 7 p.c.	115—125	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 19.	Rise or Fall on Week.
122,577	Feb. 19	7	7	Blyth 5 p.c. Ord.	113—118	...
732,000	Feb. 19	4	4	Hartlepool G. & W. Co. & New	65—66	...
2,430,267	Feb. 5	5	5 7/10	Newcastle & Gateshead Con.	15/6—17/6a	- 1/6
682,856	,,	4	4	Do. 4 p.c. Pref.	80—85	- 2
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	80—85	...
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	97—102	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	111—113	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 19.	Rise or Fall on Week.
542,270	Feb. 12	6	9	Derby Con.	103—108	...
55,000	June 10	4	4	Do. 4 p.c. Deb.	96—102	...
20,000	June 24	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	June 24	5	5	Do. 5 p.c. Deb. ...	100—105	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations July 19.	Rise or Fall on Week.
10,000	Feb. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord. ...	170—180	...
79,000	,,	10	10	Do. 'C' Ord. ...	160—170	...
1,806,339	Feb. 26	6½	6½	Sheffield Cons.	119—122	...
95,000	July 8	4	4	Do. 4 p.c. Deb.	96⅞— 98½	...

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

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oxygen may be supplied in the form of air, or air enriched with oxygen, without unduly diluting with nitrogen the gas produced by the hydrogenation, especially when the heat loss from the hydrogenation vessel is minimized by good thermal insulation.

Gas-Supply Control Valves

According to a patent granted to O. Horstmann, the Horstmann Gear Company, P. C. Sugg, and W. Sugg & Co., Ltd. (No. 522,579; application date, Dec. 9, 1938), a gas supply control valve for admitting gas to a distant automatic valve is characterized in that the control valve embodies a shunt passage permitting the flow of gas from the inlet to the outlet side by-passing the main valve passage. It also embodies a pressure governor for controlling the pressure of the body of gas in the service pipe between the two valves when the control valve is closed.

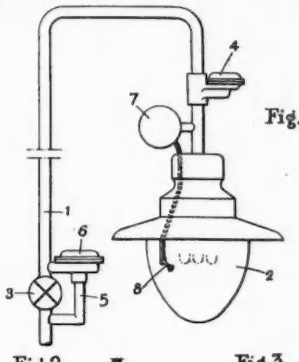

Fig.1.

Fig. 1 is a diagram illustrating an installation to which the patent is particularly applicable; Fig. 2 is a sectional elevation of the control valve; and Fig. 3 is a section at right-angles to Fig. 2 taken on the line III—III of Fig. 2.

Fig.2. Fig.3.

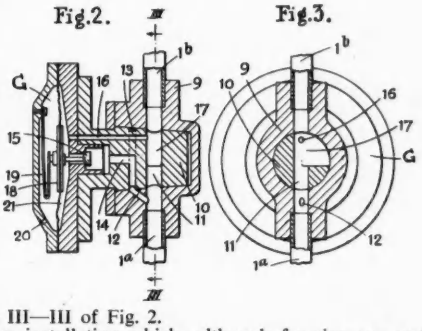

Fig. 1 shows an installation which, although forming no part of the present patent, will serve to render clear an understanding of the latter. In this Figure the service pipe 1 supplies gas to a lamp 2 through the control valve 3 and thence through a pressure-operated relay valve 4 (herein termed the automatic valve). Valve 4 is disposed at the lamp end of the pipe 1 and is normally closed when the control valve 3 is closed, and opens automatically by gas pressure when the control valve 3 is opened. A pipe 5 is shown in the drawings as diagrammatically indicating a passage for shunting a supply of gas past the control valve 3 when the latter is closed so that the part of the service pipe enclosed between the valves 3 and 4 shall be kept supplied with gas at low pressure. In the shunt passage 5 there is interposed a micro-pressure governor 6 to maintain a substantially constant low pressure in the pipe 1. The reference numerals 7 and 8 designate a non-continuous by-pass burner.

The control valve 3, shunt passage element 5, and pressure-governor 6 are combined in the unitary and compact structure shown in Figs. 2 and 3, and this unit may be fitted anywhere in the length of the service pipe, and at any angle, with a degree of convenience and facility equal to that associated with the fitting of a plain cock.

Referring to Figs. 2 and 3, the control valve comprises a housing 9 (with unions of any suitable description for the inlet and outlet parts of the service pipe 1*a* and 1*b* respectively) in which is mounted the rotary valve plug 10. The latter has a main valve passage 11 and also a shunt or by-pass passage as follows. In the housing 9 a duct 12 leads to an annular groove 13 on the surface of the valve plug 10 and from the groove 13 the passage continues through a duct 14 in the plug; the duct 14 communicates with a governor valve 15 which is pressure-controlled, and thence leads to a passage 16 longitudinally drilled in the plug and opening near the outlet end of the main passage 11. The porting of the plug 10 includes an offset pocket 17 so that when the plug is turned through 90° anti-clockwise from the open position shown in Fig. 3, the main passage 11 is shut but the shunt passage 16 is still in communcation with the outlet pipe 1*b*.

It will be seen, therefore, that the passage through the shunt ducts 12, 13, 14, and 16, subject of course to the valve 15, is always freely open between the inlet 1*a* and outlet 1*b*.

The handle or knob of the plug 10 is formed with a micro-pressure governor designated generally G. In the form shown a diaphragm 18 carries the valve 15 which is lightly urged into the valve-open position by a spring 19. The chamber on the outside of the diaphragm is in communication with the atmosphere through the vent 20. The casing of the governor G can be made exteriorly in the form of a comparatively flat or disc-like body which forms a convenient handle for the valve 10.

In operation, when the main valve passage 11 is open, the shunt passage and governor G are idle, normal service pressure prevailing through the valve and in the pipe 1 which feeds the consuming point (e.g., lamp 2). On closing the valve 10 (3 in Fig. 1), gas passes into the pipe 1 via the shunt passage 12, 13, 14, 16, the valve 15 being normally open to permit this. The shunt passages and the governor G are designed and adjusted to permit a certain predetermined maximum pressure in the chamber 21 below the diaphragm 18 which, if not exceeded, is insufficient to close the valve 15, but which, if exceeded, will close the valve. In this manner the pressure on the outlet side 1*b* is maintained substantially at a constant.

In a modification, not illustrated, the governor G is built integrally as a part of the housing 9, and in this case the shunt passage may either be in the movable valve plug 10 or in or on the housing itself so long as it is led through the governor valve before discharging into the outlet side 1*b*.

Fire Hazards with Aluminium Paint

The following statement regarding fire hazards connected with the use of aluminium paint has been sent to us by *Noral News*:

Aluminium paint is now used for a very wide range of purposes, for the protection of metallic surfaces from corrosion, to ensure cool storage interiors, as a result of high reflectivity, to improve resistance of metals to scaling at high temperatures, &c. In view of these applications, it is important that implications to the effect that aluminium paint constitutes a fire risk, and consequently should not be used in situations where inflammable gas is liable to be encountered, be carefully reviewed.

The conditions under which sparking from aluminium-painted surfaces occurs have been well established and can now be fairly clearly defined. Tests by an aluminium pigment manufacturer have been confirmed by the recent investigation undertaken by the Safety in Mines Research Board Laboratories, which shows that under certain conditions it is possible to produce sparks by striking an aluminium-painted ferrous surface.

When aluminium paint is applied to rusty surfaces of iron or steel and the paint film subjected to temperatures sufficient to break down the elastic structure of the binding medium, cracking and release of the film is liable to occur. If this surface is then struck with a steel or bronze implement a spark or series of sparks may be produced. This has been responsible for the assumption that in the presence of inflammable vapour a fire risk is established. Careful consideration of the facts, however, reveals that a series of conditions must be present before such risk can be established. These conditions, *all* of which need to be present, are as follows:

(1) The paint is applied to a rust-coated surface.
(2) The paint medium is such as to permit cracking or has been broken down by heating to a temperature of not less than 90° C.
(3) Inflammable vapour in explosive concentrations must be present.
(4) The paint surface conforming to conditions 1 and 2 is struck with a metal or other hard-material implement.

It is highly improbable that the complete combination of these conditions would ever be met with in practice. From several points of view, therefore, the presence of aluminium paint cannot in itself be considered as constituting a true fire hazard.

In the first place, it has been shown by the investigations that no sparking occurs when the paint is applied to clean steel or iron surfaces. Thus the presence of rust particles is a necessary factor in the promotion of sparking. From the view-point of maintenance alone, no paint should be applied to surfaces on which loose rust is present; always in painting procedure is it required that rusty surfaces be cleaned down prior to painting. In fact, it is the general practice to apply a rust inhibiter as a first coat. Also, in factories where explosive vapour or material exists, maintenance receives very careful attention.

Secondly, it is necessary to consider the stringent Home Office regulations which now govern the precautions to be taken to eliminate causes of sparking where inflammable vapours are present. The prevention of possible ignition arising from the use of aluminium paint does not appear to require more rigid regulations than those which guard against sparking by impact between ferrous implements or, for example, by shoe nails striking concrete or steel floors, closing gates, and so on. Moreover, the conditions under which maintenance is carried out are carefully controlled. All these conditions are the subject of Home Office regulations.

So far as can be ascertained, the discovery of the sparking phenomenon referred to was made accidentally under conditions where inflammable vapour or gas in explosive quantities could not be present, and there does not appear to be any record of fires or explosions having been initiated from this source. It is understood that the investigations by the Safety in Mines Research Board are being continued.

This review, together with the information already published, will serve to indicate that the conditions under which the use of aluminium paint becomes a fire hazard are extremely limited when account is taken of its wide use in industry. The discovery does, however, point to the fact that where such conditions do exist the adoption of such a paint should share the careful consideration which is accorded to other possible sources of sparking.

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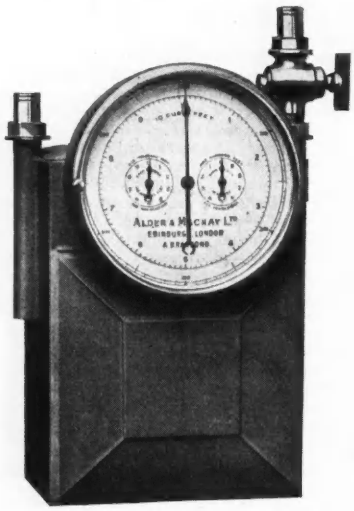

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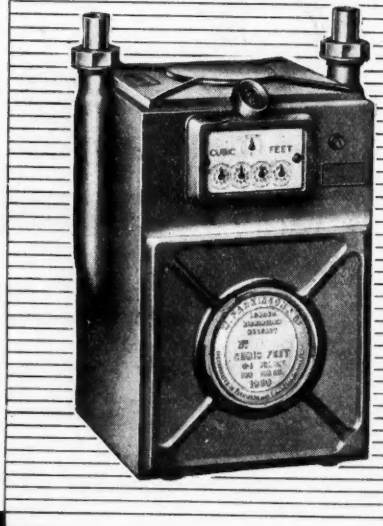

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